EDMD 6163: INTERNET RESOURCES



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EDMD 6163 Internet Resources

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Licensing

*A detailed breakdown of this resource's licensing can be found in **Back Matter/Detailed Licensing**.*

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1.1: The Digital Divide

Abstract: *A digital divide is an economic and social inequality regarding access to, use of, or impact of information and communication technologies. However, economic or other resource gaps, differences in cultural tastes and preferences of different social classes are factors contributing to disparities in internet use. The digital divide arguably reflects structural factors in advanced societies that give rise to social inequalities in general. This chapter begins with an introduction to the history of expanded internet access across the U.S. and then covers who the digital divide consequentially affected by the expended access. Finally, organizations and resources designed to aid in the closing of the digital divide are presented.*

Introduction

A digital divide is an economic and social inequality regarding access to, use of, or impact of information and communication technologies (U.S. Department of Commerce, 1995). Existing literature indicates that the digital divide at the individual level springs from many different sources. Comparisons between educational and occupational groups, income brackets, age groups, and genders have revealed systematic variation in both internet access and the frequency of its use (Hampton, 2010; Lehdonvirta and Räsänen, 2011; Rice and Katz, 2003; van Deursen and van Dijk, 2014). Economic or other resource gaps, differences in cultural tastes and preferences of different social classes are factors contributing to disparities in internet use (Emmison & Frow, 1998; Hargittai & Hsieh, 2010).

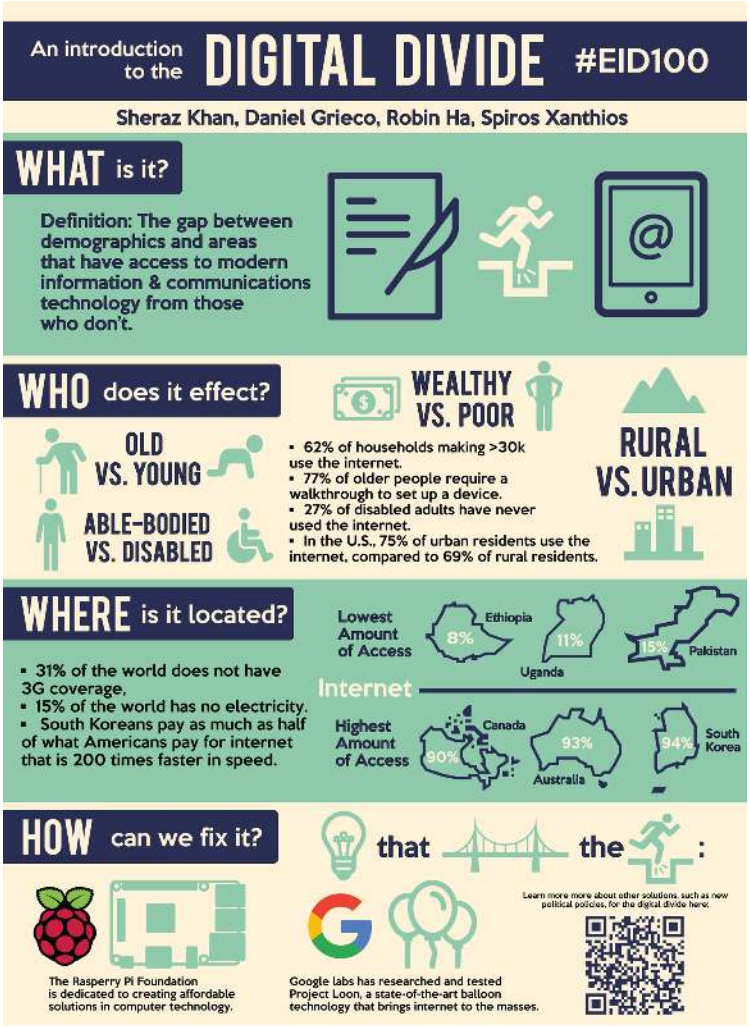
The digital divide encompasses differences in both access (first-level digital divide) and usage (second-level digital divide) of computers and the Internet between (1) industrialized and developing countries (global divide), (2) various socioeconomic groups within single nation-states (social divide), and (3) different kinds of users with regard to their political engagement on the Internet (democratic divide) (Schweitzer, 2015).

The digital divide is characterized by two crucial problems:

1. limited and costly infrastructure to support internet access
2. limited digital literacy in low/middle-income communities to use resources

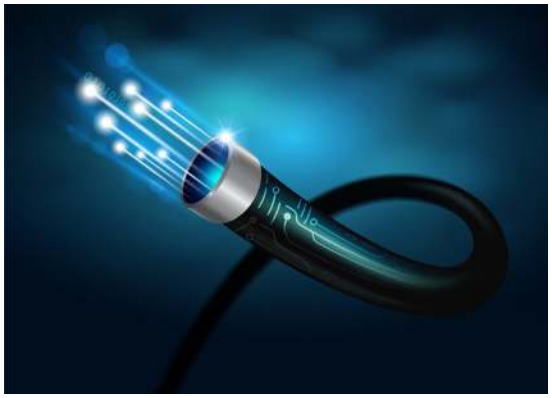
Low/middle-income communities have limited access to digital technologies due to high costs and a general lack of infrastructure, ranging from intermittent supply of electricity to limited availability of Information and Communication Technologies (ICT) facilities (Chipeva et. al, 2018; Ziemba & Becker, 2019).

The digital divide arguably reflects structural factors in advanced societies that give rise to social inequalities in general.



Xanthios, S. (2017). An Introduction to the Digital Divide. Retrieved from https://medium.com/@spirosx/an-introduction-to-the-digital-divide-33dc670f8c16.

How did the digital divide begin?



McNally, C. (2019). How Does Fiber-Optic Internet Work? – A Simple Explanation. Retrieved from https://www.reviews.org/internet-ser...internet-work/.

The first great step in moving the United States to the digital age was the passing of the High-Performance Computing Act of 1991 (Lindberg & Humphreys, 1995). The High-Performance Computing Act (HPCA) has also been called the Gore Bill. This bill, created and introduced by then-Senator Al Gore, led to the development of the National Information Infrastructure and the funding of the National Research and Education Network (NREN). The purpose of NREN was to provide internet access to all K-12

students. Al Gore was passionate about providing the same research and information tools to students that were used by businesses and the government. Teachers could use this access to share concepts, ideas, and methodologies with other teachers. Students could use it to communicate with other students and experts in various fields.

The High-Performance Computing Act funded a high-speed fiber-optic network that would eventually become the Internet (Cline & Haynes, 2001). Fiber-optic cables work by light bouncing repeatedly off the walls while traveling down the cables. Fiber-optic cables are now the primary method of transmitting information over long distances because of three main advantages over old-style copper cables (Ko & Qi, 2014):

- **Less attenuation**: (signal loss) Information travels roughly 10 times further before it needs amplifying—which makes fiber networks simpler and cheaper to operate and maintain.
- **No interference**: Unlike with copper cables, there's no *crosstalk* (electromagnetic interference) between optical fibers, so they transmit information more reliably with better signal quality
- **Higher bandwidth**: Fiber-optic cables can carry far more data than copper cables of the same diameter.

The Gore Bill led to the funding of the Mosaic browser, to which many scholars attribute the beginning of the internet boom of the '90s (Wiggins, 2010). The HPCA helped fund the National Center for Supercomputing Applications at the University of Illinois, where the Mosaic browser was developed, as well as many other technological initiatives that laid the foundation of today's modern computer networks and the internet.

Between 1991 and 1996, the number of personal computers in the United States jumped from 300,000 to over ten million (Weiss, 2007). By the mid-1990s the development of internet browsers like Mosaic and Netscape were leading more adventurous users out into a new realm called cyberspace (Weiss, 2007). Email was becoming an increasingly useful application, and officials in the Clinton Administration were beginning to wonder if access to information technology was being fairly distributed. In summer 1995, the new National Telecommunications & Information Administration prepared a report called Falling Through the Net: A Survey of the 'Have Nots' in Rural and Urban America (Rapaport, 2009).

In January 1996, the New York Times took up the call, running an article proclaiming, "A New Gulf in American Education, the Digital Divide." The story compared the availability of computers and internet access at two nearby California Schools. (Students at the less affluent school had to make do with a six-year-old IBM PC, while students at the other, more affluent school were able to go home and work on their own Apple Macintosh computers.) In October 1996, the New York Times reported a story from Georgia titled, "A Nation Ponders Its Growing Digital Divide." This piece reported that "only 9 percent of American classrooms have access to the internet." Soon after, the Reverend Jesse Jackson referred to the Digital Divide as "classic apartheid," while the NAACP's Kweisi Mfume called it "technological segregation." Al Hammond and others at the National Telecommunications and Information Administration took the "Digital Divide" one step further, using the term "electronic redlining" (Rapaport, 2009).

Who does the digital divide effect?

The effect of the digital divide is a myth for many people. For those lucky enough to be on the right side of the divide, this issue may be novel. There has been a multitude of studies aimed at understanding not only what the digital divide is, but whom it affects. Many researchers have defined the evolving digital divide in terms of levels (Dolan, 2016). They describe it as a continuum influenced by overlapping factors, such as digital inequity (Dolan, 2016), as "a New Digital Divide" driven by the intersection of race and gender (Jackson et al., 2008), and even as "Digital Divide 2.0" (Vie, 2008).

Researchers found that quantifying the digital divide was a more difficult task because there are various contributors to the divide. In its early stages, the negative effect of the digital divide had disproportionately excluded men. With men being most of the online U.S. population, gender was a notable predictor of internet access. In 2017, The International Telecommunications Union reported that the proportion of women using the internet was 12% lower than the proportion of men; this gender gap widens to 32.9% in the least developed countries (Singh, 2017). And even when a woman gets on a phone or is online, she might face additional hostility. A Web Foundation report states that "women around the world report being bombarded by a culture of misogyny online, including aggressive, often sexualized hate speech, direct threats of violence and harassment involving use of private information for defamation (Web Foundation, 2015)."

By 2001, women had surpassed men as most of the online U.S. population. 2009 Census data suggests that potential disparities in gendered connectivity have become nearly nonexistent; 73% of female citizens three years and older compared to 74% of males could access the internet from their home (Gorski, 2001). This was a very encouraging discovery, as one factor that predicted a lack of internet access has seemingly been resolved. While there is more work to be done, the digital divide is beginning to close.

Economic Disparity.

The Pew Internet and American Life Project was a project that started in 2000 and continues. It is a project that has spanned more than a decade to understand the role of the internet in the American lifestyle. The Pew Internet and American Life Project produces reports exploring the impact of the internet on families, communities, work, and home, daily life, education, health care, and civic and political life (Pew, 2018). The project's reports are based on nationwide random phone surveys, online surveys, and qualitative research. This data collection is supplemented with research from government agencies, technology firms, academia, and other expert venues. The Project releases the data from 15-20 research projects each year, varying in size, scope, and objective. According to the Pew Report, "Digital Differences," only 62% of people in households making less than $30,000 a year used the internet, while in those making $50,000-74,999 that percentage jumped to 90. Smartphones have helped bridge the divide, as they provide internet access to populations previously at a digital disadvantage. Pew reports that, among smartphone owners, "young adults, minorities, those with no college experience, and those with lower household income levels" are more likely to access the internet primarily through their phones. There are still gaps in high-speed internet access. Only 49% of African Americans and 51% of Hispanics have high-speed internet at home, as compared with 66% of Caucasians. Internet speed has important effects on media access, especially when it comes to streaming video, so this gap is significant.

In a Pew survey of teachers, teachers of low-income students tended to report more obstacles to using educational technology effectively than their peers in more affluent schools. Among teachers in the highest income areas, 70% said their school gave them good support for incorporating technology into their teaching. Among teachers in the lowest income areas, that numbers were just 50%. 56% percent of teachers in low-income schools say that their students' inadequate access to technology is a "major challenge" for using technology as a teaching aid. 54% of all teachers said their students had adequate internet access at school, but only 18% said their students had adequate access at home. Interestingly, urban teachers are more likely to say students have poor access to the internet at school, while rural teachers are more likely to report that students have poor access at home (Zickuhr, 2012).

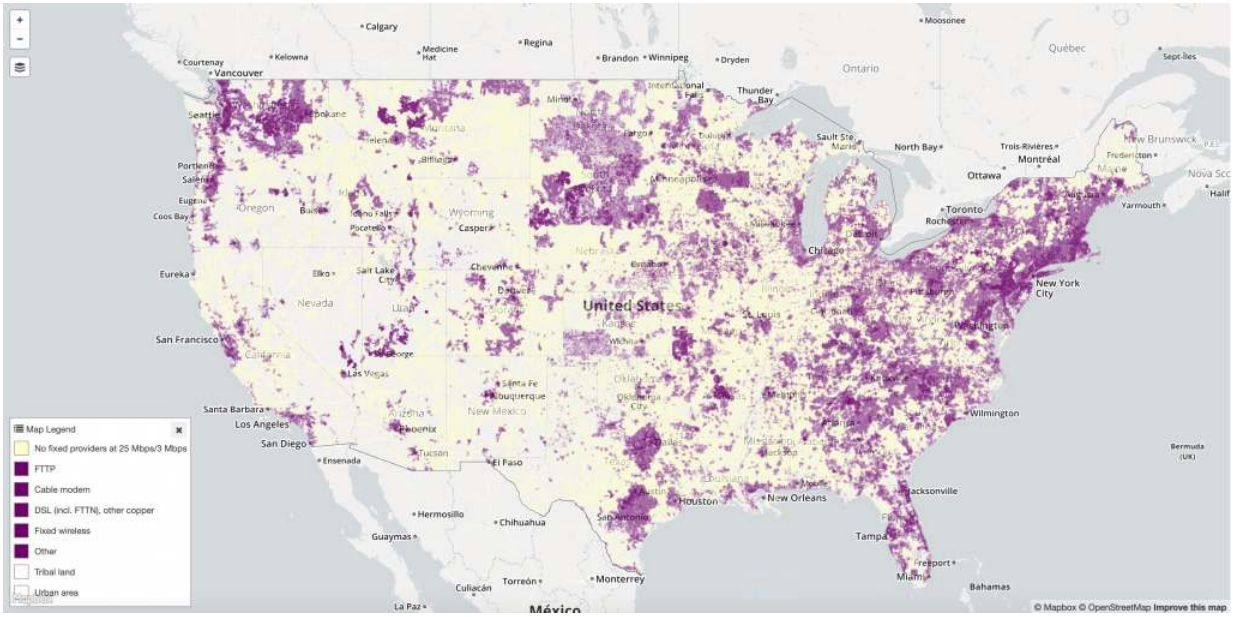
Access to resources.

92% of individuals aged 12–17 years go online daily, while 97% of them play computer, web, portal, or console games and 75% of them own a smartphone (Lenhart, 2015). However, not all students have an equal opportunity to access and use computers at home and in schools (Dolan, 2016). Historically, this access disparity has been called the "digital divide," a definition that focuses on the "haves" and "have-nots" regarding physical access to a computer (Dolan, 2016).

Roughly three-in-ten adults with household incomes below $30,000 a year (29%) don't own a smartphone. More than four-in-ten don't have home broadband services (44%) or a traditional computer (46%). And many lower-income Americans are not tablet owners. By comparison, each of these technologies is nearly ubiquitous among adults in households earning $100,000 or more a year.

The disparity in online access is also apparent in what has been called the "homework gap" – the gap between school-age children who have access to high-speed internet at home and those who don't. In 2015, 35% of lower-income households with school-age children did not have a broadband internet connection at home, according to a Pew Research Center analysis of U.S. Census Bureau data.

In 2017, Federal Communications Commission Chairman Ajit Pai reiterated his commitment to bringing high-speed internet services to lower-income communities (Pai, 2017). To review the Federal Communications Commission's progress toward closing the digital divide, please access the embedded map below.



Bridging the Divide.

Surveys indicate that in the United States, more than 80% of all teachers believe that online learning improves education. While many consider access to technology at home to be critically important to the quality of a student's education, it is alarming that one-third of all students in America, mostly from low-income households, lack that access in their home settings. Having a computer and internet service at home is no longer a luxury – it is a necessity (Leander, Scharber & Lewis, 2017; Grigoryeva, Abukenova & Gill, 2018). There are numerous initiatives that are designed to address the digital divide, below are two examples.

Cox Communications.

Internet providers are working to provide affordable Internet and devices to low-income students and their families through programs such as the Connect2Compete program by Cox Communications. Cox's program is open to families with K-12 children who qualify for free or reduced school lunches through the National School Lunch Program (NSLP), Temporary Assistance for Needy Families (TANF) or the Supplemental Nutrition Assistance Program (SNAP). Also, Cox has partnered with the U.S. Department of Housing and Urban Development (HUD) to support its ConnectHome initiative. Families with K-12 children who live in Public Housing, as well as K-12 families who receive Tenant-Based Vouchers, Project-Based Vouchers or Section 8 Project-Based Rental Assistance (PBRA), are eligible for Cox's Connect2Compete discounted internet service offer. Since 2012, nearly 200,000 people have been connected to the internet through Cox's Connect2Compete program – most of them for the very first time. This is one of the many programs that has been used to bridge the digital divide. In a 2015 survey of parents enrolled in the program, the grades of more than 50% of the students have improved and nearly 50% say their children are more interested in school.

Close the Gap.

Access to information and communication technology (ICT) is essential in the developing world because it is key to improving a country's educational and economic prospects. However, the cost of new equipment, limited infrastructure and the lack of information technology (IT) knowledge and proficiency mean that many people still have no access to IT. Today, information is seen as one of the major drivers of economic and social development and ICT makes access to information available on an unprecedented scale. The digital divide is not only a divide between people who have access to ICT and people who don't. It's also a divide between people who know about ICT and those who don't, between people who realize the opportunities presented by ICT and those who don't. It consists of an infrastructure gap, a knowledge gap, and a psychological gap.

Close the Gap (http://close-the-gap.org/) is an international non-profit organization that aims to bridge the digital divide by offering high-quality, pre-owned computers donated by European companies to educational, medical and social projects in developing and emerging countries. Close the Gap collects decommissioned computers from companies and arranges for other organizations to clean the hard disks and then check and configure the hardware according to the requirements of its end-users. The computers are

then shipped to the destination country by sea or air transport. Since 2003, Close the Gap has already received more than 250,000 computers from companies all over Europe.

Close the Gap not only provides computers to developing countries, but it also builds partnerships with organizations worldwide to deliver comprehensive software and hardware solutions to its recipients. Today, Close the Gap has supported more than 2,500 projects all over the world. However diverse the projects, they all have one common denominator: a focus on advancing both the individual and the community within a spirit of socio-economical education. By following this principle, Close the Gap is participating in the United Nations Millennium Development Goals.

Conclusion.

The digital divide started because of a very progressive effort. The purpose of the National Research and Education Network was to provide internet access to all K-12 students. This effort, while well-founded, generated a divide in access to the internet. This subsequent divide had many contributing factors, including income and gender. Since the identification of the digital divide in 1996, efforts have been made to remedy it. Programs such as Close the Gap and Connect2Compete have been implemented to bridge the digital divide. The authors of this chapter believe that knowledge is power and that as individuals learn more about the prominence of the digital divide, the call to action will increase. Understanding learning in the digital age means understanding the solutions and problems that arise as the world becomes more digital. Many opportunities to aid in bridging the digital divide exist.

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SECTION OVERVIEW

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1.2.1: 22.1 Introduction

Learning outcomes

- Teach practical skills effectively.
- Describe typical problems you may encounter when teaching practical skills in labs.
- Describe pros and cons of virtually controlling real equipment.
- Design effective lab tests for online learners.
- Gain acceptance for online labs.
- Discuss the future of online labs.
- Discuss the strengths and weaknesses of drill and practice programs, tutorials, simulations, educational games, intelligent tutoring systems, and virtual reality applications.
- Develop and select instructional materials.

This chapter first focuses on the viability of teaching lab, shop, and other practical skills in a virtual environment. I discuss instructional design considerations for online labs as well as how educational technology can support online learners, especially given problems with “live” labs. I also discuss ideas regarding controlling real equipment, how lab tests can be handled, and ideas with respect to articulation. I also share some thoughts on the future of online labs. The instructional design topic will address learning outcomes that focus on important skills, content areas that will be stronger or weaker than traditional labs, and strategies for effectively teaching lab skills online. I will present a variety of computer-based resources that can support learners beyond more common online strategies. These resources include drill and practice programs, tutorials, simulations, and educational games. The chapter will conclude with brief notes on intelligent tutoring systems and virtual reality applications.

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1.2.2: Online Labs

Online (or virtual) labs simulate traditional settings, and sometimes take students beyond what can be done in a traditional lab. In general, there are two types of labs. One simulates real experiments, equipment, or procedures, while the other lets learners access and control real equipment from a remote location. These are different from software simulations that emulate real-world scenarios such as investing money, controlling power plants, and flying airplanes. An online lab is not created simply by transferring a lab workbook to a website, allowing students to access software from different campus or off-campus locations or enabling them to submit assignments via the Internet. In this chapter, the term “lab” is used generically for any setting where practical skills are taught, such as in labs, shops, and classrooms.

Some online labs let you simulate lab procedures or equipment. For example, using the computer’s mouse, students can get a beaker, put a precise amount of a specific chemical in it, and virtually carry out all of the needed procedural steps. This is useful for preparing students to carry out lab procedures efficiently in a reallife lab. One problem is that online labs are much more valuable if the learner can also see the results. It would be ideal to let learners virtually mix chemicals and to provide opportunities that would be too costly or dangerous to carry out in a real lab. However, as the number of variables increases, the complexity of online lab design and possibilities increase. Imagine all of the possibilities with all of the different chemicals mixed together in different volumes, concentrations, combinations, and sequences. You could theoretically state what would happen for each case but, for practical reasons, students would not be able to see a video clip or animation of each possibility.

Problems with Teaching Lab Skills in Traditional Way

There can be numerous problems when teaching practical skills in typical face-to-face labs:

- When a demonstration is done, some students, such as those in the back of the class, may not be able to clearly see what is being demonstrated.
- Many instructors will not show all of the possible demonstrations, due to time, cost, or equipment limitations.
- Dangerous, expensive, or unavailable equipment or materials may limit what learners can see or do.
- The costs of building and maintaining labs are high.
    - Even if a lab can be built, funds are still needed to run labs. Staff, materials, and equipment replacement due to breakage as well as wear and tear are significant. Equipment upgrades are also a costly, important consideration.
- It may not be possible or practical to teach some skills.
    - For example, one way to teach troubleshooting involves taking components out of functioning systems, breaking them, putting them back in, and letting students determine the problem. However, this is impractical because of the time it takes to remove, break, and install components, cost of later repairing the components, problem that this needs to be done to many components, and time required to have all of the students individually determine the problem for each broken component.
- In many cases, if a student misses a lab, they will not have the opportunity to do it later.
- Students are often not able to repeat a lab if something goes wrong. This is often due to time constraints.
- Existing media, needed to teach practical skills, may not be easily available.
    - A common illustration of this is where a repair person may need to see a series of video clips or photographs while working on equipment.
- Some existing traditional teaching materials that are used in labs are not effective.
    - In one case, a 20-minute videotape was created to train student mechanics how to disassemble and assemble an aircraft engine. However, the total disassembly and assembly requires approximately 200 steps. The videotape did not provide the details that the students needed.
- It may not be possible to offer live training.
    - Logistical challenges can arise when experts do not have enough time to travel to reach learners or even to simply have the time to teach (i.e., there is no extra time in their full-time job).
- Learners may not be able to attend live training locations.
    - This is an inherent problem in distance education. Many learners can learn the theory online or through other distance education solutions. However, they may not be able to learn the needed practical skills at a distance. Yet, these practical skills are often essential for enhancing learning.
- Costs to attend live training can be high.

    - This can be seen when numerous participants are required to travel to a workshop.
- There may be a need for just-in-time learning.
    - There are many times when a learner needs immediate training and cannot wait for a course or workshop to become available or be completed.

Given sound instructional design strategies, technology has solved these problems. For example, online labs can:

- show close-ups of procedures that all can see
- show extra demonstrations
- contain an individual's expertise
- offer alternative instructional approaches
- eliminate the costs of travelling to face-to-face labs
- be available when and where a student wants
- show expensive or dangerous procedures as the procedures would only have to be done once for the recording session and would then be available as needed
- include media, especially short, step-by-step video clips to illustrate specific concepts or procedures such as disassembling and assembling an aircraft engine.
- provide "just-in-time" learning

Instructional Design for Online Labs

The general principles of instructional design apply to all educational materials. However, when designing online labs, there are other things to consider. These are discussed below.

Learning outcomes

Consider what the learner really needs to learn rather than what you want to teach or have traditionally taught. More specifically, for practical skills, determine what the learner actually needs to do. One way to do this is by imagining what skills the learner needs in the real world. To illustrate this, in some cases in the laboratory portion of chemistry, the learner does not really need to pour one chemical into another. The important skills relate to the observations, data analysis, and conclusions that are drawn. For teaching practical troubleshooting skills, the needed skill may be the ability to analyze the interrelationships between components of the system. Regardless, of the application, an online lab should simulate the actual practical skills needed to ensure that learning is authentic. In other words, online labs should focus on skills needed in the real world.

> **Note**
>
> Focus on what the learner really needs to learn. Previously taught skills may not be relevant.

Creating the instructional strategy

The instructional challenge is to ensure that the practical skills taught via the computer transfer to the real world. Evidence supports that, with solid instructional design, this can be done. The foundation for the instructional design is the learning outcomes. The learning outcomes, lead to the design of the instructional strategy—what needs to be done to ensure that the students will effectively and efficiently learn.

For the instructional strategy, determine how to ensure that most all learners will learn effectively. This is a particular challenge when students are on their own and cannot have their questions immediately answered. Think outside the box to guarantee learning. Consider simulation, discovery-learning techniques, and active experimentation. Page-turning activities will not suffice for learning many practical skills. Use the technology for its strengths rather than simply transferring content from one format to another.

> **Note**
>
> The key is to determine what needs to be done to ensure effective learning will occur.

Think about the limitations of teaching each skill online. You will have to realistically determine what level of skill you can achieve. For example, in an online biology lab, how would you teach a student to learn how to use a microscope? This is a limitation of using online technology. However, a lot can be done with visual media. You could show the coarse adjustment being

used to focus an image, then show what would be seen inside the ocular lens, then show fine adjustments being made, and then what the learner would see inside the ocular lens. A practical activity could have the learner clicking on arrows to move the coarse and fine adjustments (clockwise and counter-clockwise) and see the corresponding image of what would be seen. The goal would be to find the clearest image. Video clips and activities can similarly be used for demonstrating other microscope components, such as the condenser lens. This would not be as good as what is done in a real lab, but would definitely give a sense of how a real microscope works.

Other activities could potentially lead to better results than a real lab. As a comparison, in a real lab, students see specimens and are then asked to draw what they see so that they can later study from their drawings. In an online lab, students will see full-colour video clips and photographs that they can later study for their lab test. One key in creating a successful online lab is getting as close as possible to reality (given constraints of time and money).

A part of the instructional strategy is to organize the information into small enough chunks for the students to successfully learn. A typical need for this is when a procedural skill has numerous steps. If so, consider teaching the entire process in logical groups of three to six steps. Many instructional resources provide too much information or too many steps for students to learn at one time.

Instructional strategies should include some content on the potential avenue for making mistakes. Ask the content expert about typical mistakes made after the content is taught in the traditional way. If one only teaches what is correct, the learner may never learn what can go wrong. Teaching what can go wrong is helpful in teaching students about safety in chemistry labs.

> **Note**
>
> Address potential mistakes that learners make in live labs.

Teaching practical skills via computer usually requires a variety of specific media to enhance learning as well as to test skills. It is often difficult to test practical skills with only text. Plan in advance to record photographs and video clips of skills done incorrectly. These become excellent resources for testing. One challenge will be in creating the media needed since live labs typically depend on some copyrighted material. It is not safe to assume that you can get copyright clearance from the originators, especially if you plan to sell the product.

Determine whether assessment is realistic as a true measure of performance. This is particularly important for practical skills. When testing, consider all difficulty levels. Many existing technology-based resources are weak in that they only address low-level thinking skills rather than the actual skills needed.

Make the program highly interactive throughout. Interactivity requires the learner to actively think while learning. Creating interactions in the virtual environment is easily done. You can have students drag and drop items, increase and decrease settings to observe results, make decisions and see consequences, and answer questions based on video clips and photographs showing correct and incorrect procedures or results. Remember to always provide detailed feedback, even when the answer is right. This is in case the student guessed the correct answer or answered correctly for the wrong reason(s).

> **Note**
>
> Ensure that you keep the learner engaged and thinking throughout.

Controlling Real Equipment

Virtually controlling real equipment can be challenging. One problem is enabling control across computer platforms. Although it is not trivial, it can be solved with web-based tools that are designed for interoperability and machine-to-machine interaction over a network. However, this is a major problem if the equipment is not designed for remote access. Virtual control may require a lab technician for some tasks such as preparing and loading samples. Will this need to be done 24 hours per day and seven days per week? It is hard to generalize whether the overall labour, materials, and facilities costs will be higher for live labs or virtual labs that enable remote control of real equipment.

There may be some logistical problems with allowing remote access to equipment. Imagine if 100 students signed up for a course that included remote access to equipment. Consider 1,000 virtual students. Can large numbers of virtual students be supported? What if “live” students also need to access the equipment? What happens if a virtual student wants to access equipment that another virtual student is using? How does a lab technician support more than one virtual student at a time? When will the equipment be available for virtual students? How many units will be available for remote control?

Note

Determine the logistics, benefits, and costs of virtually controlling real equipment before taking on such a project.

Handling Lab Tests

Lab tests can be done any way you want. You can:

- Have students come to campus to be tested in a live lab. However, this would prevent some students from being able to complete an online program.
- Require students to write paper-based exams. It may be that only a portion of the skills could be adequately tested in a paper-based format. Invigilation may need to be addressed.
- Have learners complete a computer-delivered test. The test could be wholly or partially based on learning objects, especially video clips and photographs, already used in the online lab. Invigilation may need to be addressed.

Articulation

Articulation may be an issue. Some people will simply be adverse to change, or assume that an online lab is inferior to a live lab. Other people will argue that you cannot replace the real thing, or that some things cannot be simulated online. (Sometimes the sense of touch and smell play important roles in learning.) Since most online labs only show the correct results, some will resist online labs because an advantage of actual labs is that significant learning takes place through mistakes that students make. (You can disarm that argument by addressing typical errors in your designs.) Yet others will need research confirmation of effective results before accepting the technology. The good news is that some are claiming that online labs can be rigorous enough to be equivalent to actual labs. An online lab you create might initially only be approved for a limited group of students (e.g., non-science majors).

You will need to gain the support of all stakeholders. You can foster initial acceptance by involving articulation committee members in the formative evaluation and later conducting a summative evaluation. With successful results in a summative evaluation, it is more likely that there will be approval for any student to learn via an online lab. Articulation is more fully discussed in Chapter 12, Articulation and Transfer of Online Courses.

Note

Do what you can to ensure you get the support of the articulation committee.

The Future of Online Labs

It is difficult to predict the future of online labs. However, the reality is that online labs will continue to be created. Some will be of minimal value while others will effectively meet the needs of distance learners and solve the previously mentioned problems of live labs. Some questions will need to be answered:

- Can all labs, ranging from introductory to advanced, be delivered online?
  - In some courses, all of the lab skills can be successfully delivered online, while in others the labs should only be offered live. There is a limit to how much can be conducted online. Would it be reasonable for a student to get a biology degree without ever working with real specimens and a real microscope and other lab equipment? It is likely that everyone would answer this question with a resounding “No”.
- Will administrators of post-secondary institutes or the government require the use of online labs to save costs?
  - Only time will tell. Already many institutions have opted to have labs every second week. The official rationale is that this enables students to be better prepared for labs. The reality is that it is to save costs. One option is to conduct every second lab online. This would accommodate a larger number of students when there are limited lab resources. Note that some governments have already applied pressure to eliminate some labs.
  - Another option is to use online labs to speed up lab time. If students know exactly what procedures they will be doing online, they can spend less time in the live lab, thus freeing up room for more students.

Note

Be ready to answer questions about the effectiveness and economy of an online lab.

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1.2.3: Computer-Based Resources

The following computer-based resources for learning (drill and practice, tutorials, simulations, educational games, intelligent tutoring systems, and virtual reality) are sometimes needed to support learners when more common online strategies, described in other parts of this book, will not suffice. Some drill and practice activities can be effectively provided within learning management systems. However, depending on the learning domain, thinking level required, complexity of the problem presentation, and feedback that needs to be provided, some drill and practice activities will need to be created on tools such as Macromedia Flash. In general, all of the other resources described below need to be created on software that is not found within learning management systems.

Drill and Practice Programs

Drill and practice is a common computer-based training strategy that provides repeated activity (drill) and opportunities (practice) to try skills or concepts learned elsewhere. The aim is often to achieve mastery.

Drill and practice:

- Usually takes place after the content has been taught.
- Does not teach new material.
- Can, and often should, include extensive diagnostic feedback.
- Can be used for many skills such as learning language, learning factual information, and solving problems in mathematics, physics, chemistry, electricity, nursing, etc.
- Should usually have a varied difficulty level that is based on the student's ability in order to enhance learning.
- Can be boring.
    - You can counter boredom with competition, using visuals, providing variety, stating the progress made, or giving a reward if a target is met.

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1.2.4: Tutorials

Tutorials are programs in which the computer imitates a human tutor. In tutorials, information or concepts are presented, questions are asked, responses are judged, and feedback is provided.

Tutorials:

- Should include frequent questions and/or other activities that require the learner to think, as well as provide detailed feedback.
- Can be used for many low- and high-level skills.
- Can include drill and practice.
- Can include solving problems.
- Often include branching to remediation and enrichment.
- Often include testing.

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1.2.5: Simulations

Simulations present or model the essential elements of real or imaginary situations. This is shown in Figure 1.2.5.3. Computer-based simulations (e.g., flight simulators) allow students to learn by manipulating the model in similar ways to real world situations. Simulations can immediately respond with consequences to learner decisions. However, some consequences may not initially be apparent, depending on when the effect is normally seen (e.g., the effects of changes in interest rates may be seen years later). Students can learn by observing results and relationships (this can be through a discovery-learning strategy) or receiving specific diagnostic feedback, especially when detailed feedback is provided for both right and wrong answers.

Ideally, simulations should approximate real systems as closely as possible. This helps facilitate transferring the knowledge learned to the real world and can make the simulation particularly meaningful to the learners. How closely a simulation must approach reality depends on the complexity of the real situation, how well the skills learned will transfer to the real situation, and the benefits and costs of making the simulation more realistic. Conduct a detailed analysis to determine all of the relevant skills needed and their importance.

Simulations can be used for teaching many skills including:

- Properties of physical objects such as a comet in its orbit
- Rules and strategies such as in war games, making predictions about forest fire behaviour or avalanche potential, or building a city
- Processes such as laws of supply and demand
- Procedures such as diagnosing illnesses
- Situations such as teaching instructors how to deal with student behaviour and attitudes

Simulations are often used when real situation training is:

- Dangerous (e.g., nuclear power plant procedures and police maneuvers)
- Expensive (e.g., landing a space shuttle)
- Unethical (e.g., when it is not appropriate to use humans)
- Not easily repeatable (e.g., avoiding a run on a bank)
- Unavailable (e.g., historical events such as the economics of the Great Depression, how to respond in a robbery, or operating a business)
- Not conducive to learning (e.g., when learning is difficult because the learner must consider too many stimuli at once, such as in the cockpit of a modern airplane)
- Affected by reality such as time (e.g., simulations can provide genetic data about successive generations immediately, where reality could take months or years)
- Inconvenient (e.g., experiencing Arctic survival, undersea, and outer space conditions).

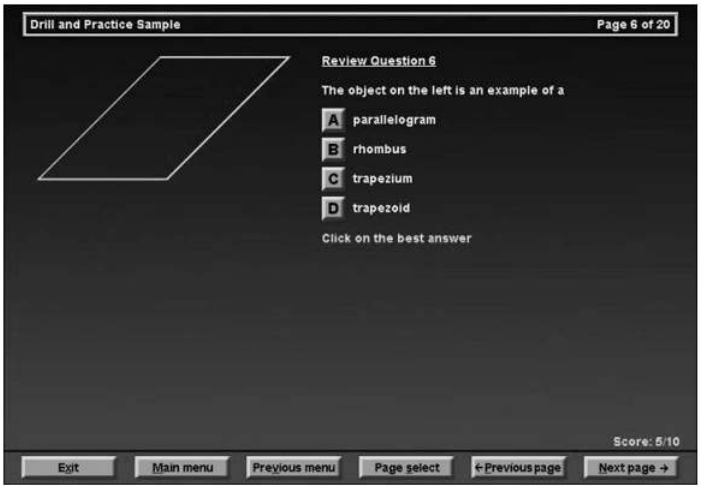


Figure 1.2.5.1: Drill and practice sample

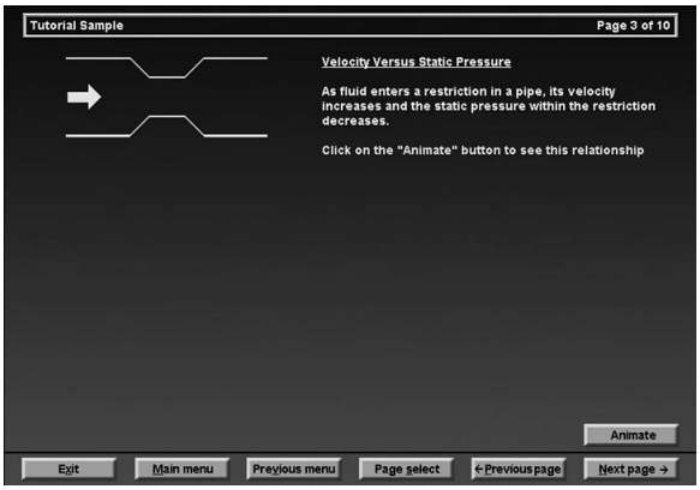


Figure 1.2.5.2: Tutorial sample

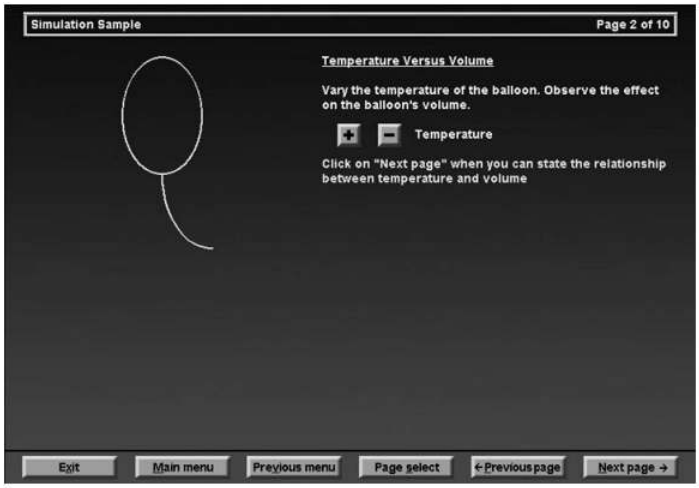


Figure 1.2.5.3: Simulation sample

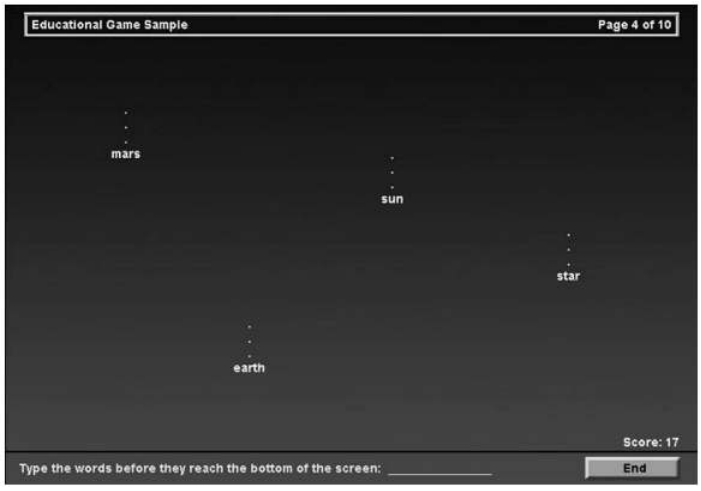


Figure 1.2.5.4: Educational game sample

Simulations can be very effective.

- The knowledge gained tends to transfer well to real situations if students can apply their existing knowledge and experience. Active student participation is critical.
- Effectiveness increases if the simulation is logical or comparable to real situations.
- Effectiveness is enhanced if students are aware of the learning outcomes.

- Effectiveness increases if students can gradually build their skills. For example, when first learning how to operate a nuclear power plant, the student should first learn each system independently, then combinations of dependent systems, and then the entire system.
- Effectiveness can stem from students being very motivated to learn. Imagine your motivation if you are involved in a life and death situation, or investing your life savings.

Attaining excellent results requires more explanations of the goals, learning outcomes, and directions than tutorials or drill and practice methods. Some learners, such as young or immature students, will have trouble explaining what has happened in a simulation, or transferring the knowledge to real situations.

> **Note**
>
> Students may not necessarily believe the results of a simulation. As an example, in a simulation, students may end up in a car accident if they chose to drink and drive. However, there is no guarantee that students believe that could happen to them in real life.

Simulations can be very efficient for relatively quick learning. The efficiency increases if:

- the model or simulation closely represents reality.
- learners receive useful feedback with respect to the learner outcomes.
- the model or simulation is aimed at the appropriate learning level.
  - Novices may learn best when only some of the variables can be manipulated, and experts when presented with the entire model.
- the level of detail is appropriate.
  - If too much detail or too many parts of the system are shown, learning may be hindered since the learner may not be able to mentally process all of the information.
- supplementary material is provided.
  - Text summaries and checklists can be very beneficial.

Effective, efficient simulations are usually expensive and time-consuming to create. Cost-justification is particularly important before creating a simulation.

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1.2.6: Educational Games

Educational games are usually decision-making activities that include rules, a goal, conditions or constraints, competition, challenge, strategies, and feedback. Games can be as simple as answering questions to win Tic-Tac-Toe or filling in crossword answers to more complex games that require interactions with other learners.

Educational games:

- should encourage the development of specific skills
  - The skills can be in specific subject areas such as science and math or general skills like literacy, problem solving, critical thinking, and decision-making.
  - Success should be based on whether the specific learning outcomes have been met, rather than on good hand-eye coordination.
- can be used to teach many different skills
  - The example shown in figure 22.4 illustrates how a game can be used to teach keyboarding skills.
  - One difficulty is that games tend to require more explanations of the goals, learning outcomes, and directions than tutorials or drill and practice methods. Without guidance, learning is less effective.
- can be an effective, motivational, and fun way to learn
  - To be effective, the game must be challenging, students must be actively involved, and students must be given feedback and guidance with respect to the learning outcomes.
  - Research has shown that many learners like to learn through educational games.
  - Some educational games are a part of simulations that involve competition and/or cooperation.
  - Both males and females can enjoy and learn from games suited to their interests.
- are sometimes a waste of time
  - Some products are fancy but do not teach well.
  - Evaluate a game before purchasing it to ensure that the game teaches an important skill effectively. Some games may lead to violent and aggressive behaviours.
  - Some people erroneously believe that games cannot be effective teaching tools.

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1.2.7: Intelligent Tutoring Systems

Intelligent tutoring systems attempt to mimic the “perfect instructor”. The basic requirements of an intelligent tutoring system include the ability to:

- model the learner
- track misunderstandings
- generate appropriate responses.

None of these basic requirements have been perfectly resolved.

Although it is possible to incorporate a model or two of student learning into a computer-based training application, a fixed model does not represent intelligence. How can a “typical” student be modelled when students and their learning preferences are so diverse? It is not sufficient to simply categorize students into one of two types and then create two ways for students to learn the material. This has been the premise in some “intelligent” tutoring systems. A compounding factor is that learner preferences vary depending on the situation and material being taught. It is impractical to create a different teaching strategy for every individual. See Chapter 20, Learning Strategies, for more information on learning styles.

Although intelligent tutoring systems should be adaptable, based on the learner’s previous successes and failures, it is a challenging goal. It is simple to record where students make mistakes, but a challenge to know when there is a misunderstanding, what caused it, and what to do about it. In a sense, the computer would have to be able to read each student’s mind.

Generating the appropriate response would be difficult even if the first two needs were met. How can a designer determine all of the response possibilities? Every possibility must be based on a known rule. Intelligent tutoring systems can and should have responses for expected misunderstandings but this is, at best, limited to the finite expressed problems.

There are some excellent intelligent tutoring systems available. However, these tend to be labour-intensive and expensive to develop. Although the potential of intelligent tutoring systems is exciting, the reality is that much research still needs to be done. In other words, instructors need not worry about being replaced by an intelligent tutoring system. Given the present state of the technology, it can be argued that well-designed instructional multimedia applications are essentially the same from a student’s perspective.

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1.2.8: Virtual Reality

Virtual reality (VR) allows people to be totally immersed in an artificial or simulated environment, while experiencing the environment as real. This happens because the participant has a first-hand or personal experience of the events, distractions are minimized since only virtual images are seen, and the participant can interact naturally in real time, such as by pointing and looking, rather than by using a joystick, mouse, or keyboard. VR can feel so real that some people experience vertigo when sensory inputs to the brain are in conflict. VR systems can include a variety of media such as video, visuals, animation, and audio. In a sense, VR is an extension of simulations that can be created with readily available hardware and software. Commercial flight simulators are examples of this.

A distinctive feature of VR is that learners are an integral part of the synthetic VR world. Users can simultaneously interact with computers in complex ways. Computers can sense body movement and voice commands and respond almost naturally. For example, for teaching students about interior decoration, you could let students walk through a house and allow them to change colours of walls, rearrange furniture, change the lighting, and remove a painting and place it elsewhere. To interface with the virtual world, learners must wear specialized equipment such as body suits, goggles, and/or gloves.

Although most applications are found in the entertainment industry, numerous educational products have been and are being developed. Since VR allows participants to feel that they are in another place in which they can move and look around based on a prescribed set of rules, VR offers incredible educational potential. Imagine how much doctors, army field surgeons, soldiers, firefighters, and law officers, could safely learn in a virtual environment. Abstract ideas, such as the movement of electrons in an atom that cannot be physically presented, can be taught with VR. Since virtual objects can behave as their physical counterparts and be manipulated by the learner, students can experience natural laws such as the law of gravity. Alternatively, learners can experience unnatural laws created by developers. In a virtual world, energy could be created or destroyed. With the ability in VR to manipulate abstract information, the potential exists to improve a student's understanding and memory of complex ideas.

Learning can be by discovery, experimentation, through guidance using a variety of instructional approaches, or by practice and feedback. The potential for testing in a virtual environment is exceptional. For example, students could virtually perform an operation, put out a fire, or apprehend a thief.

For practical reasons, it can be risky to develop an educational VR system at this time:

- There are few experts in VR design and programming.
- The authoring software is mediocre but getting better.
- Extra equipment is needed for developing and using these programs.

A key to effective VR design is to focus on the potential to teach and learn rather than on the hardware and software tools.

Given the potential of multimedia technology, where is the boundary between computer-based simulations and virtual reality applications?

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1.2.9: Summary

Online labs simulate and teach what learners must do in traditional settings. In general, there are two types of labs. One simulates the real experiments, equipment, or procedures; the other lets learners access and control real equipment remotely. There can be numerous problems when teaching practical skills in typical labs.

Online labs can solve many of the problems. Online labs will continue to be created. Some will be of minimal value while others will effectively meet the needs of distance learners. Some questions will need to be answered:

- Can the labs of all courses, ranging from introductory to advanced, be delivered online?
- Will administrators, of post-secondary institutes or the government, require the use of online labs to save costs?

The instructional challenge is to ensure that the practical skills taught via the computer transfer to the real world. The foundation for the instructional design is the learning outcomes, which should be based on what the learner actually needs to do. Based on your learning outcomes, the design phase leads you to creating an instructional strategy that guarantees effective learning. To do this:

- Consider simulation, discovery-learning techniques, and active experimentation.
- Determine what level of skill you can achieve.
- Organize the information into small enough chunks for the students to learn successfully.
- Include some content on the potential for making mistakes.
- Include media, as needed, to enhance learning as well as to test skills.
- Determine whether testing is realistic enough and a true performance measure.
- Make the program highly interactive throughout.

Some online labs enable learners to control real equipment. Virtually controlling equipment can be challenging and may save some money. For lab tests, you can:

- have students come to campus to be tested in a live lab
- require students to write paper-based exams
- have learners complete a computer-delivered test

Articulation may be an issue. Many will find reasons to resist the technology. You can increase acceptance by involving articulation committee members in the formative evaluation. You can also gain support if a summative evaluation proves successful results.

The following computer-based resources are sometimes needed to support learners when the more common online strategies will not suffice:

- Drill and practice is a common computer-based training strategy that provides repeated opportunities to try skills or concepts learned elsewhere.
- Tutorials are programs in which the computer imitates a human tutor. In tutorials, information or concepts are presented, questions are asked, responses are judged, and feedback is provided.
- Simulations present or model the essential elements of real or imaginary situations. Ideally, simulations should approximate real systems as closely as possible. Simulations can be used for teaching many diverse skills. Students can learn by observing results and relationships or receiving specific diagnostic feedback.
- Educational games are usually decision-making activities that include rules, a goal, conditions or constraints, competition, challenge, strategies, and feedback.
- Intelligent tutoring systems attempt to mimic the “perfect instructor”. The basic requirements of intelligent tutoring systems include the ability to model the learner, track misunderstandings, and generate appropriate responses.
- Virtual reality (VR) allows people to be totally immersed in an artificial or simulated environment yet retain the feeling that the environment is real. A distinctive feature of VR is that learners are an integral part of the synthetic VR world. Users can simultaneously interact with computers in complex ways.

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CHAPTER OVERVIEW

2: Module 02- Open Education Resources

2.1: What is Open Source or Free Software ?

2.2: ‘Open Licences’ of Copyright for Authors, Educators, and Librarians

2.2.1: Introduction

2.2.2: Software Open Licences

2.2.3: Open Licences for Non-Software Material

2.2.4: Access to Knowledge and Information Sharing

2.2.5: Concluding Comments

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2.1: What is Open Source or Free Software ?

Open source as a term has only been in existence since 1998. Prior to that, and running parallel with that term, has been “free software”. Lately, open source has become the more generic public term. For Stallman and his Free Software Movement, the highest premiums have always been placed on personal/collective intellectual freedom, and he holds fast to the term “free software”. He says, “Proprietary software is a social problem and our aim is to solve the problem” (Stallman, personal communication, September 10, 2006). Stallman also says, “In nearly all cases, the software which is called ‘free’ is also open source, and the software which is called ‘open source’ is also free (though there are occasional exceptions to the latter). The difference is a mainly matter of the philosophy that the speaker endorses” (personal communication, September 10, 2006). At its most basic, open source and free software mean that the coding for an application or software has been made freely available to the public. It’s the why of that action where things get tricky. For that reason, I refer to both types of software collectively as “freely sourced”.

The spirit of freely sourced software is the spirit of collaboration in much the same way collaboration is meant to drive Web 2.0—code is revealed for people to use it, modify it and share the program/application with others. We see behind the curtains, and anyone can tinker with the Wizard’s machine, add to it, make it better, and redistribute it. In this way, freely sourced programs evolve through collective efforts. It is both evolutionary and revolutionary in those respects. Open source and free software applications are constructivist in nature. Due to wide ranging and rapid input from programmers around the world, software development time can be condensed and programs become far more responsive to users’ varied needs. Unlike proprietary commercial software, freely sourced applications are designed for user customization.

The Open Source Initiative [OSI] (http://www.ossinstitute.org), one of the leading and guiding open source organizations, specified 10 characteristics for open source licensing:

- free redistribution;
- readily available and useable source code;
- permission for modification of the original code and derived works;
- conditions for maintaining integrity of the author’s source code;
- equality of access regardless of person or group;
- equality of access regardless of field of endeavour;
- extension of original free distribution rights for subsequent redistributions;
- independence of, or extractable from, particular packages of software or hardware;
- licensing restrictions of the open source program do not automatically extend to additional software distributed along with it;
- non-restriction of the software to any type of technology or user interface so that it may be redistributed via means other than the Internet and may run in environments that do not allow for popup dialogue windows. (Open Source Initiative, 2006a).

As of April 2007, the OSI (2006b) approved 58 variations on open source licensing, among them the General Public Licence (GPL) (Free Software Foundation, Inc., 1991) of Stallman’s Free Software Foundation, Inc. (FSF) (http://www.fsf.org/).

This doesn’t mean that open source software is completely non-commercial or non-proprietary: open source (as opposed to free software) varies according to the extent of its proprietary-nature and levels of commercialization. Jive Software (http://jivesoftware.com) is a company providing instant messaging software that institutions can leverage to provide real-time contact between instructors, students, and any other users, especially useful for tutorials and collaboration. Jive dual-licences its communication server, Openfire (formerly Wildfire) first as Open Source General Public Licence (GPL)10 by providing access to source code, modification, and redistribution rights and second as a commercially licensed “Enterprise” version (Jive, 2007).

Two major repositories/directories of freely sourced software and applications are the Free Software Directory (http://directory.fsf.org/) and Sourceforge.net (http://sourceforge.net/). SourceForge boasts a repository of over 100,000 projects and claims the “largest repository of open source code and applications available on the Internet” (Open Source Technology Group, 2006). Here you can find Pidgin (http://www.pidgin.im/), an interoperable instant messaging application, and DotNetNuke (http://www.dotnetnuke.com), a framework for “creating and deploying projects such as … websites, … intranets and extranets, online publishing portals, and custom vertical applications” (DotNetNuke, 2006a). If you’re of a more technological bent, and speak “programmer”, you might use Koders.com (www.koders .com), the self-proclaimed “leading search engine for open source code” (Koders, 2006).

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SECTION OVERVIEW

2.2: ‘Open Licences’ of Copyright for Authors, Educators, and Librarians

2.2.1: Introduction

2.2.2: Software Open Licences

2.2.3: Open Licences for Non-Software Material

2.2.4: Access to Knowledge and Information Sharing

2.2.5: Concluding Comments

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2.2.1: Introduction

Learning outcomes

- Understand what open licence software is about and start looking for an appropriate licence for software you are developing;
- Appreciate the advantages and disadvantages of using open licence software;
- Understand how open licensing for non-software educational material works;
- Appreciate the access to knowledge movement and what it aims to achieve.

An open licence, as used in this chapter, is a neutral expression for a licence granted by someone who holds copyright in material allowing anyone to use the material subject to the conditions in the licence but without having to pay a royalty or licence fee.

There are many different open licences, some for computer software and some for other forms of material. Each has its own terms, conditions and vocabulary. This chapter is an introduction to open licence language and to the open licences that are important for authors and educators. It is not legal advice. Individuals or institutions thinking of committing themselves to open licensing should get professional legal advice about the implications of the licences they are considering using.

Supporters of the different licences do not always agree with one another. There are even extremists who, disliking the business practices of some commercial software suppliers and publishing houses, want to use open licences to do away with restrictions on using copyright material. Despite the understandable wish of some open licence supporters to reform copyright law, open licences are legal tools that use the existing copyright law. They rely, in particular, on the exclusive right copyright law gives a copyright holder to licence material with an open licence or any other form of licence.

The chapter starts by looking at software open licences. Software developers working on open licence software will need a more detailed explanation of the different open licences than they will find in this chapter. But even authors and educators with no pretensions to ICT expertise depend on operating systems, word processors, communication packages and online learning software. This part of the chapter aims at providing such users with an introduction to open licence software and its advantages and disadvantages.

Understanding software open licences is also a good introduction to the open licences that apply to other materials and, in particular to Open Educational Resources (OERs). The second part of the chapter looks at these open licences and, in particular, at the Creative Commons licences. The chapter ends by looking briefly at the Access to Knowledge (A2K) movement that aims at making all forms of information more freely available.

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2.2.2: Software Open Licences

The Hacker Culture

Open software licenses had their origins in what Eric Raymond calls the hacker culture. (Eric Steven Raymond How to Become a Hacker 2001, latest revision 2007, http://www.catb.org/~esr/faqs/hacker-howto.html). For Raymond and those who work with open license software "hacker" has its original meaning of a committed software developer. It does not refer to a criminal who breaches computer security. Hackers share their discoveries and feel free to use the work of other hackers. This leaves hackers free to work on unsolved problems rather than waste creative energy repeating what others have done. Hackers who publish their work, either on the Internet or in other ways, have copyright in it. At first, however, few hackers bothered with copyright. Some were not even concerned with their moral rights, the right to be recognised as the author of original material.

It is not clear how to understand this in terms of copyright law. It could have been argued that this behaviour reflected or created a trade custom among hackers. Or, because hackers often used the Internet to share work, it could have been taken as evidence of an implied license that allowed members of the Internet community to use material on the Internet without permission. Certainly, many early Internet users assumed that they were free to use anything they found on the Internet. But it is doubtful that these arguments would have served as a defence if an author had sued for breach of copyright. The second argument reverses the usual legal position in which a copyright holder has to license another to use the copyright holder's work. And with both arguments it would have been difficult to establish the terms of the license or custom and who qualified as a member of the community to which it applied. But whatever the exact legal position, this was how it was when software developers were mostly academics or researchers who often used the Internet to share scientific or technical information.

Some developers did claim copyright in software they developed. They did this by making their products available as freeware or shareware. Freeware is copyright material which the copyright holder allows others to use without charge. Shareware is copyright material which the copyright holder allows others to use subject to a small charge or condition. Freeware and shareware are not the same as open license software because they do not envisage users continuing to develop and distribute the material.

Growth of Commercial Software

Some of the lack of interest in ownership in computer software may have been because, in the early days of computers, the software was not seen as distinct from the computers on which it ran. But as computers for ordinary users became popular, particularly after the launch of the IBM PC in 1981, it became clear there was a separate market for software for these computers. This market grew as personal computers became more powerful and able to run more complex software. And it received another boost when, towards the end of the 1990s, ordinary users began to access the Internet through the World Wide Web. From the 1970s onwards most countries recognized copyright in software and in 1996 the WIPO Copyright Treaty made it clear that software fell under copyright law. Some commercial software developers became very wealthy from licensing the software they had developed. Some countries have even taken the controversial step of giving software added protection by allowing software patents.

Today businesses are always looking out for new and useful software. If they can acquire rights over the software they will invest in marketing it. When they do this they usually allow only those who pay their license fee to use the software. And they do not usually allow users access to the software's source code. Source code is the human-readable version of the software used to create the computer program. Restricting access to the source code means that in practice only the software owners can develop the software. Software of this sort is known as "closed software" or "proprietary software".

Software Open licenses

The hacker community and those who sympathized with their ideals saw the possibility that all software would become closed or proprietary. To stop this happening they developed open licenses of which the following are some of the more important.

BSD licenses

The Berkeley Software Distribution (BSD) license was developed by the University of California, Berkeley and first published in 1989. But some of the BSD software goes back to 1977 and the BSD license is said to embody the conditions under which this software was released. This means the BSD license may have been the earliest open license. Some important software is available under BSD licenses including the software that runs many domain name servers and a Unix-like operating system.

Different versions of the BSD license have developed. BSD licenses have few restrictions on how the software may be used. They differ from the GPL, discussed below, in not insisting that developments of BSD software be distributed on the same terms and in not insisting that source code be made available to those to whom the object code is distributed.

GNU licenses

Richard Stallman is a prophetic figure who campaigns for free alternatives to commercial software and, in particular, for a free alternative to the Unix operating system that AT&T, the US telecommunications giant, developed. In 1985 Stallman published the GNU Manifesto (GNU standing for Gnu's Not Unix) setting out his ideals and established the Free Software Foundation (FSF) to support this work.

In 1989 Stallman published the first version of the GNU General Public license (the GPL). There is also a GNU Lesser General Public license (LGPL) that allows for linking GPL software and software not published with the GPL and a GNU Free Documentation license (FDL) for software development documentation and manuals. The GPL is now in its third version and, about three-quarters of the world's open license software uses the GPL. This software includes the Linux operating system, an alternative to Unix, that Linus Torvald released under the GPL in 1991. The following are some of the main features of this important license.

A powerful (and contentious) feature of the GPL is what Stallman calls "copyleft". Copyleft, shown by a reversed © symbol, means that others are free to develop a GPL work on the condition that any work derived from a copy-left work is distributed subject to a similar condition. This means the GPL license is what some call "viral", it tends to take over software originally published under other open licenses.

Another feature of the GPL is that GPL software must be conveyed with its source code. This is to make it easier to develop the software. Not every open license requires this.

To those who think of software open licenses as anti-commercial, a striking feature of the GPL is the absence of restrictions on using GPL software to make money. As the preamble to the GPL puts it: "Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish) …" In the past few years this has begun to happen. Red Hat, for example, is a company listed on the New York Stock Exchange. It develops and distributes a version of Linux, Red Hat Enterprise Linux. Since 2002 IBM has been offering this as an operating system for IBM computers. Dell, a major supplier of personal computers, has previously offered its computers with Linux operating systems and is now selling some computers with Ubuntu Linux. Even a corporation like Novell that sells software rather than computers, is using a version of Linux, SUSE Linux, as an operating system.

The advantage to these and other corporations of using open license software is that they do not have to develop this software themselves or pay license fees for software others have developed. They get the benefit of the work independent developers put into open license software and can concentrate on improving the products or applications that are their speciality. In return, independent developers get access to the work these corporations put into adapting open license software. Open license developers are also well qualified to work for the corporations and provide support to the corporations' clients. They are even free to market the software on their own account.

The growth of the commercial use of open-license software has not stopped individuals and groups supported by not-for-profit organizations from continuing to develop GPL software. The Shuttleworth Foundation, for example, has sponsored Ubuntu Linux. Ubuntu Linux is meant to be easy for non-technical people to use and, in particular, supports other languages than English. It is this version of Linux that Dell is offering on its personal computers. Ubuntu also has a commercial sponsor, Canonical Ltd, that provides training and support for Ubuntu users.

As already mentioned, anyone who acquires GPL software and develops it may only distribute the developed software under the GPL. But someone who develops original software, meaning here software that is not a development of other software, is free to decide how to license it. Such a developer is free to use more than one license. So software may be distributed under the GPL and another open or proprietary license. This raises the question whether someone who develops original software and distributes it with a GPL license may withdraw the GPL license? Because the GPL is perpetual anyone who acquires a copy of original software from the developer under the GPL is free to continue to use the software. It is not entirely clear whether the developer can prevent those who have already acquired the software from passing it on to others. But it is clear that the GPL does not require a developer to continue to distribute software and this may make it difficult for others to acquire the software. In addition, the GPL does not require the developer of original software to offer further developments of the original software under the GPL. By not offering further developments under the GPL the developer of the original software will lessen the attractiveness of the earlier GPL version.

The GPL came out in 1989. A second version, GPL version 2, came out in June 1991 and GPL version 3 in June 2007. Version 3 has two interesting new provisions. The first is in clause 11 dealing with the GPL and patent rights. The other is in clause 3: “No covered work shall be deemed part of an effective technological measure under any applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, or similar laws prohibiting or restricting circumvention of such measures”. This means a person is free to remove coding of this sort if it appears in GPL software.

Other software licenses

Some software developers use other open source licenses. They may do this because they want to avoid the copyleft restrictions in the GPL that make it difficult to use the software commercially or because they do not want to require licensees to distribute the source code. Or they may have to use another license because the software on which they are working began with a different license. The following are some examples of other software open licenses and how they came about.

Sendmail is a widely used program for managing email that was first published under a BSD license. In 1999, following difficulties in developing and supporting the software as an open license product, a company was formed to do this commercially while leaving the software available under an open license. This called for changes to the BSD license that resulted in the sendmail license. The sendmail license, it has been pointed out, is not listed as an open source license at the Open Source Initiative website discussed below.

Netscape, on the other hand, was a commercial software developer that produced the influential Navigator web browser and Communicator email software. Following competition from Microsoft’s Internet Explorer, Netscape decided to release the source code for these products under an open license while continuing to develop the software commercially. To enable them to do this they produced they Mozilla Public license. The successors to Navigator and Communicator, Firefox and Thunderbird, use this license. Other developers, particularly by those who want to have both commercial and open license versions of their software, also use this license.

The Apache Software Foundation has its own model for software development that has resulted in non-GPL licenses. The Foundation grew out of a community of developers who, around 1995, were working on projects that included the important Apache HTTP Internet server. According to the Apache Foundation website: “All software developed within the Foundation belongs to the ASF, and therefore the members”.

Open Sources Initiative

As the number of open licenses has grown so it has become difficult for non-specialists to understand the differences between them. In 1998 the Open Source Initiative (OSI) was founded to be “the stewards of the Open Source Definition (OSD) and the community-recognized body for reviewing and approving licenses as OSD-conformant” (http://www.opensource.org/about).

The OSD is a list of 10 requirements that software must meet to qualify as open source. The Open Source Initiative keeps a list of licenses it considers comply with its definition of open source. It has a trademarked logo that those whose licenses comply with the definition can use. It might seem it should be possible to use any OSD-compliant software with any other OSD-compliant software. This, however, is not always the case as some of the licenses contain incompatible terms.

Advantages and Disadvantages of Open license Software

Traditionally open license software users were technically sophisticated. They probably shared the ideals of organizations like the Free Software Foundation and may even have helped develop the software they used.

Increasingly, however, open license software users have little or no technical expertise. They simply want to save money by switching to open license software rather than pay for commercial software from suppliers like Microsoft. Stand-alone products like open license products like Firefox and Thunderbird should present these users with few difficulties. But non-technical users are likely to resent having to learn how to use the more complex products that are an alternative to Microsoft Windows and Office. In addition, some of the proprietary software on which an individual or institution depends may not may not be easy to run with open license software or be available in an open license version. Open license software is also likely to need as much support as the equivalent commercial software. Support here means help with installing the software, manuals, training for users and access to experts. Before committing themselves to open source software, users with little technical expertise should check these points and, in particular, be sure adequate support will be available and know what it will cost. Businesses using open license software should also bear in mind that most open licenses disclaim liability for any damage resulting from the software. They may need to consult their insurers.

It is worth noting that some software managers working in higher education institutions have reservations about using open license software for sensitive data. Their concern is that if the source code is available it is easier to attack the software and publish, change, or destroy the data.

Open licenses are popular among educators. But individuals and institutions that distribute their original software with an open license may be giving up the possibility of royalty revenue from those who use their software. They need to weigh this against the advantages of open licensing and the possibility of exploiting their software in other ways. They should also be aware, as has been mentioned, that they have the option of licensing the software with an open and a proprietary license.

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2.2.3: Open Licences for Non-Software Material

The success of open licence software led to an interest in using open licences for non-software material and especially for educational and scientific material. The list of individual and institutional signatories to the Cape Town Open Education Declaration of 2007 (www.cape towndeclaration.org/) shows how much support there is for open licence educational resources (OERs).

Early Open Licences

Open licences for non-software material came some time after open licences for software. The earliest such non-software open licence may have been the Open Content Licence that David Wiley of Open Content published in July 1998. The following year, in June 1999, the Open Content Project published the Open Publication Licence.

GNU FDL

In March 2000 the Free Software Foundation released version 1 of the GNU Free Documentation Licence (the FDL). The FDL was meant for software developers writing manuals and documenting their work but it can be used for other forms of material. Wikipedia, for example, uses the FDL. A revised version, FDL version 1.2, appeared in November 2002 and the Free Software Foundation is working on version 2. The FDL, like the GPL, allows for commercial publishing. If, however, the GNU website list of 30 or so commercially published FDL books is complete (gnu.paradoxical.co.uk /doc/other-free-books.html), FDL material is not yet as attractive to commercial publishers as the GPL software is to commercial software developers.

Creative Commons Licences

Open licences for non-software material began to attract serious attention in 2001 when Lawrence Lessig and others started Creative Commons (CC). The CC licences are now the most important open licences for non-software material.

CC rights

The CC licences are based on the CC analysis of copyright rights. This distinguishes between four rights of a copyright holder. The CC website lists and explains these rights:

> “Attribution. You let others copy, distribute, display, and perform your copyrighted work—and derivative works based upon it—but only if they give credit the way you request.”
>
> “Noncommercial. You let others copy, distribute, display, and perform your work—and derivative works based upon it—but for noncommercial purposes only.”
>
> “No Derivative Works. You let others copy, distribute, display, and perform only verbatim copies of your work, not derivative works based upon it.”
>
> “Share Alike. You allow others to distribute derivative works only under a license identical to the license that governs your work.”

All the CC licences include what CC calls the “Baseline Rights”. These are the rights to copy, distribute, display, perform publicly or by digital performance and to change the format of material.

CC licences

In theory the four CC rights, used singly or combined, allow for eleven different possible licences. In practice CC offers only six licences. These licences allow copyright holders to grant users different combinations of the CC rights. This flexibility makes the CC licences more attractive to authors than the all-or-nothing open licences that are usual for software. As the CC website says:

> Creative Commons defines the spectrum of possibilities between full copyright—all rights reserved— and the public domain —no rights reserved. Our licenses help you keep your copyright while inviting certain uses of your work—a “some rights reserved” copyright.

The CC website has a diagram that shows the spectrum from copyright to public domain with CC licences occupying the space between these two:



Figure 2.2.3.1

CC also takes into account that copyright law differs from country to country. As well as a generic or unported version of each licence CC aims at providing a version, in the appropriate language, adapted to the law of each country where the CC licences are used. This means there is no one CC licence in the way there is one GNU GPL. With CC licences it is always necessary to specify which national version of the CC licence is being used, and, in some cases, the language version of the licence.

In addition to the CC licences, CC provides a form for an author to place a work in the public domain. This is only legally possible in some countries. CC also has a procedure for recreating the original US copyright term of 14 years.

CC uses symbols and abbreviations to represent the four rights of a copyright holder and combines these symbols and abbreviations to represent the different licences. The names, abbreviations, and symbols of the six CC licences give some idea of the complexity of the CC licence system:

- Attribution Non-commercial No Derivatives (by-nc-nd)
- Attribution Non-commercial Share Alike (by-nc-sa)
- Attribution Non-commercial (by-nc)
- Attribution No Derivatives (by-nd)
- Attribution Share Alike (by-sa)
- Attribution (by)

CC licence generator

The text of the CC licences and their different language versions is on the CC website. The CC website does not, however, expect users to study every licence before choosing one. Instead, there is a licence generator that suggests the appropriate CC licence based on the answers to following three questions:

- Will an author allow commercial use of the work?
- Will an author allow users to modify the work? (Included under this question is the possibility of allowing users to modify the work if they share alike.)
- In which jurisdiction does an author want to license the work?

The questions are a convenient starting point for commenting on the six CC licences.

Jurisdiction

It is useful to start with the third question on the jurisdiction of the licence. If a work will be used mainly in one country an author should select that country. If an author is publishing a work internationally or if there is no licence for the country in which the author is publishing, the author should answer ‘unported’. The unported version of a licence is a generic, international licence. The following discussion of the other questions will refer to the unported versions of the licences.

Restriction on commercial use

The first question the licence generator asks is: “Allow commercial use of your work?” If the copyright holder does not want to allow commercial use of the work the licence generator suggests a non-commercial (NC) licence. What this means is that a copyright holder who finds individuals or institutions making commercial use of the work can take legal steps to stop them doing this. But what does non-commercial mean? Section 4b of the unported CC Attribution-Non-Commercial 3.0 licence says:

You may not exercise any of the rights granted to You in Section 3 above in any manner that is primarily intended for or directed toward commercial advantage or private monetary compensation. The exchange of the Work for other copyrighted works by means of digital file-sharing or otherwise shall not be considered to be intended for or directed toward commercial advantage or private monetary compensation, provided there is no payment of any monetary compensation in connection with the exchange of copyrighted works.

One view of what this means, often forcefully expressed in workshops and discussion groups, is that noncommercial means that no money should change hands. This is not, however, the usual meaning of noncommercial. It is not a commercial transaction, for example, to refund someone for buying me a loaf of bread or even to pay that person’s travelling expenses. It only becomes commercial if that person wants to make a profit out of providing this service. It follows that someone who distributes an NC work should be able to charge to recover expenses incurred in distributing the work. These expenses, typically, would include copy

charges, salaries and overhead expenses. The only restriction is that anyone doing this does not intend to make a profit out of distributing the work. This is the view of the Draft Guidelines that CC published to try to clarify the meaning of non-commercial. ("Proposed best practice guidelines to clarify the meaning of 'noncommercial' in the Creative Commons licenses" available at wiki.creativecommons.org/DiscussionDraftNon Commercial_Guidelines)

There is still some uncertainty, however, about what "primarily intended for or directed toward commercial advantage or private monetary compensation" in section 4b means. It could be argued that even if a project does make a profit, the use is still non-commercial if the project was not primarily intended to make a profit. According to this view, an organization that is run for profit may use NC material and may recover its expenses for distributing NC material provided the project using the NC licensed material does not aim at making a profit.

This raises questions such as whether private schools run for profit or public broadcasters that accept advertising revenue may use NC-licensed material for teaching or informing their viewers? (See Mikael Pawlo, "What is the meaning of non-commercial" in Danièle Boucier & Mélanie Dulong de Rosnay, International Commons at the Digital Age: La création en partage 2004 Romillat, Paris 69 at 78–82. Available at fr.creativecommons.org/iCommonsAtTheDigitalAg e.pdf) Another question is whether a business whose profits support a non profit body such as a university may use NC material. The Draft Guidelines appear to prohibit using NC material in these ways. Section C(2) of the Draft Guidelines, for example, says that it is not non-commercial if money changes hands to, for example, a for-profit copy shop. Section A(1)(b) insists that an educational institution or library using NC material must be nonprofit. And section B appears to classify as commercial any use of NC material in connection with advertising.

What the Draft Guidelines say, however, does not settle the matter. The Draft Guidelines are not part of the NC licence. As section 8e of the NC licence says: "This License constitutes the entire agreement between the parties with respect to the Work licensed here." And a notice at the end of the licence says "Creative Commons is not a party to this License, and makes no warranty whatsoever in connection with the Work." The Draft Guidelines themselves do not claim to be an authoritative. CC published them to "elicit feedback about whether these guidelines accurate reflect the community's (including both licensors and licencees) understanding of the term". This means that what the Draft Guidelines say should be treated with respect but any dispute between a copyright holder and a user can only be settled on the basis of what the licence says. This raises the question whether any ambiguities in the wording of the licence should be interpreted strictly, to limit the use of NC material, or generously, to allow the widest use of a work.

CC plans to return to the question of the meaning of non-commercial. It would be helpful to know what authors who use the NC licence really want to achieve. They do not want royalties for their work but they do, presumably, want the work to be made widely available. If these authors object to associating their work with commerce in any way, the Draft Guidelines should be followed. If, on the other hand, these authors want only to avoid commercial interests taking over and restricting access to their work, the authors may be prepared to allow their work to be used by organizations or individuals working for their own profit provided they do not limit further distribution of the CC work. And this could be achieved by using a SA ShareAlike licence.

As with all the CC licences, it is always possible for a commercial user to approach the author of a work directly and ask for permission to use CC licensed work in a way the CC licence does not cover.

Modifications allowed

Once a user has decided whether to allow commercial use, the licence generator's second question is: "Allow modifications of your work?" There are three possible answers to this question: "Yes", "No", and "Yes as long as others share alike".

Particularly where the licensed material is educational material, users are likely to want to modify it by adding examples and other material, by translating it into another language or adapting it in some other way. The licence generator will suggest that those who want to allow users to modify their material use either a simple attribution (BY) licence or an attribution non-commercial (BY-NC) licence. Which it suggests will depend on the answer to the first question: "Allow commercial use of your work?"

The simple attribution licence, not combined with a NC restriction, allows a user to do anything with the material except claim copyright in it or authorship of it. A user may modify the material or leave it as it is and market the modified or original material commercially and keep any profit.

No modifications

If the answer to the licence generator's second question "Allow modifications of your work?" is "no", the licence generator will suggest an ND (no derivate works) licence. The human readable summary of version 3 of the unported Attribution-No-Derivs

licence says: “You may not alter, transform, or build upon this work.”. The legal code prefers to speak of not adapting a work. Section 1a defines adaptation as:

> a work based upon the Work, or upon the Work and other pre-existing works, such as a translation, adaptation, derivative work, arrangement of music or other alterations of a literary or artistic work, or phonogram or performance and includes cinematographic adaptations or any other form in which the Work may be recast, transformed, or adapted including in any form recognizably derived from the original, except that a work that constitutes a Collection will not be considered an Adaptation for the purpose of this License. For the avoidance of doubt, where the Work is a musical work, performance or phonogram, the synchronization of the Work in timed-relation with a moving image ("synching") will be considered an Adaptation for the purpose of this License.

This means that a ND licence allows users to use, reuse and distribute a work but not adapt it.

There are situations where an ND restriction is necessary. If a work is a report or set of standards, it makes sense to insist that it is only used in its original form. Changes to a work of this sort destroy its value. Even valid corrections can be harmful because they give readers a false impression of the accuracy of the original report.

The ND restriction is also necessary if an author wants to distribute a work for comment while reserving the right to publish the final version of the work.

Some educators dislike the ND restriction and say it makes it difficult for them to use material most effectively. But the ND licence does allow for an ND work to be used in a collection. (Some versions of the ND licence call this a collective work.) Section 1b of the legal code defines a collection as:

> a collection of literary or artistic works, such as encyclopedias and anthologies, or performances, phonograms or broadcasts, or other works or subject matter other than works listed in Section 1(f) below, which, by reason of the selection and arrangement of their contents, constitute intellectual creations, in which the Work is included in its entirety in unmodified form along with one or more other contributions, each constituting separate and independent works in themselves, which together are assembled into a collective whole. A work that constitutes a Collection will not be considered an Adaptation (as defined above) for the purposes of this License.

This means that provided the ND work is reproduced whole and unmodified it can be published in a collection with a commentary or other relevant material. It is not clear whether it would be permissible to use hyperlinks to take a user directly to parts of an ND work or to connect an ND work to a commentary or other material.

Section 4 of the legal code goes into detail about how an ND work can be incorporated into a collection and how the work must be credited. It is possible to assemble a collective work consisting of materials carrying different licences. A collection may also, if it is sufficiently original, qualify for copyright protection and for its own licence which does not have to be an ND licence. When this happens the collective work’s licence will not change the licences attaching to the components in the collective work.

Share Alike

If the answer to the licence generator’s second question “Allow modifications of your work?” is “Yes, as long as others share alike” the licence generator suggests a share alike (SA) licence. This ensures that modified works based on the licensed material are available to others under the same conditions as the original work. The share alike licence offers authors the possibility of making their work “viral” in a way that is similar to the GPL. Version 3 of the unported of the Attribution-Share-Alike licence says:

> You may Distribute or Publicly Perform an Adaptation only under the terms of: (i) this License; (ii) a later version of this License with the same License Elements as this License; (iii) a Creative Commons jurisdiction license (either this or a later license version) that contains the same License Elements as this License (e.g., Attribution-Share-Alike 3.0 US); (iv) a Creative Commons Compatible License. The CC’s symbol for share alike is almost exactly but not quite the same as the FSF’s symbol for copyleft.

Attribution

All the CC licences require what CC calls attribution. The human readable summary of version 3 of the unported Attribution licence explains what attribution means:

> You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work)

Changing or withdrawing a licence

The CC licences all say the licence is for the duration of copyright and only ends if the person holding the licence breaks the terms of the licence. Section 7b of version 3 of the unported Attribution licence, for example, says:

> Subject to the above terms and conditions, the license granted here is perpetual (for the duration of the applicable copyright in the Work).

Whether an author can stop those who have not begun using the material, from acquiring rights in terms of the original licence is an awkward question. Section 8a of the licence suggests that an author cannot do this:

> Each time You Distribute or Publicly Perform the Work or a Collection, the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License.

There is a problem with this clause in that the identity of the "relevant third party" is unknown until someone begins to use the work. This means that an author is bound to an uncertain person. Not every legal system accepts that this is possible. If an author does withdraw a licence this will not affect the rights of those who had previously begun to use the material.

Concluding comments on CC licences

There was no CC equivalent to the GNU Manifesto although there is now a "Free Content and Expression Definition" that may serve as a manifesto. It seems, however, that what the founders of the CC movement had in mind was a community producing material that it would make available under the CC licences in the same way as there are communities of software developers. making software available under different licences. There two features of the CC licences that might hinder this.

First, the system of CC licences is complex and, as has been shown, the meaning of the licences is not always clear. A pre-publication review of this chapter advised against publishing some of the comments for fear that they might weaken confidence in the CC licences. It seems, however, that long-term confidence in the CC licences will only be possible when difficulties of the sort this chapter raises have been resolved.

Second, and possibly more importantly, authors and educators 'need to eat'. Those in regular employment and those supported by public or private grants may be happy to use the CC licences. But authors earn their living from their work might be reluctant to use the CC or any other open licence. Commercial publishers, whether they publish traditionally or online, are unlikely to want to pay authors for the rights to publish a work that is already freely available. And it is difficult to see how there could be a commercial use for non-software open-licence material in the way there is for open licence software.

Other Non-Software Open Licences

Some authors draft what are, in effect, their own open licences. This can be done quite simply. So, for example, the copyright notice on the Antiquarian Horological Society's Website (www.ahsoc.demon.co.uk/) reads:

> The material in these pages is copyright. © AHS and Authors. 1996 – 2007. The information may be downloaded for personal use only. The information may be passed on to another party for their private use provided that the source and this copyright information is acknowledged. The material may not be reproduced in quantity, or for commercial purposes.

Open licence drafting, however, is not always a simple matter and not every home-grown licence is free of problems. The United Nations Disaster Management Training Programme, for example, has the following licence on some of its training material:

> The first edition of this module was printed in 1991. Utilization and duplication of the material in this module is permissible; however, source attribution to the Disaster Management Training Programme (DMTP) is required.

In this licence it is not clear whether 'utilization and duplication' includes making derivative works and using the material commercially for profit.

The African Medical Research Foundation, to take another example, has licensed some of its educational material with CC Attribution-Share Alike licence. The Foundation then goes on to explain that copying, reproducing and adapting the material is "to meet the needs of local health workers or for teaching purposes". It is not clear if this limits the CC licence. The Foundation also asks, although not as a term of the licence, for feedback on how the material is being used:

> This course is distributed under the Creative Commons Attribution-Share Alike 3.0 License. Any part of this unit including the illustrations, may be copied, reproduced or adapted to meet the needs of local health workers or for teaching purposes, provided proper citation is accorded AMREF. If this work is altered, transformed or built upon, the resulting work may be

distributed only under a license identical to this one. AMREF would be grateful to learn how you are using this course, and welcomes constructive comments and suggestions.

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2.2.4: Access to Knowledge and Information Sharing

There is a growing awareness of the importance of access to knowledge and information and of the need to prevent commercial exploitation from making important knowledge the preserve of relatively few. An example of this was President Clinton's decision to increase funding for the Human Genome Project to ensure that the sequences were not patented and limited to commercial use. When discussing access to knowledge it is useful to distinguish different kinds of knowledge or information.

Governments have detailed information about matters such as the health, safety and education of the population, trade figures, economic performance, spatial information and geodata. They collect this information for their own purposes and, in terms of the law of most countries, they have copyright in it. Such information, of course, is often also useful to researchers and commentators and to those thinking about investing in the country either to make a profit or to help development. There is, however, no single approach about whether and on what terms this information should be available.

In 2005 Brazil and Argentina proposed to the World Intellectual Property Organisation that the organization's development agenda should discuss the possibility of a Treaty on Access to Knowledge (A2K). Much of the draft of the treaty deals with widening the scope of the exceptions to and limitations on the copyright holders' rights. Part 5 is entitled "Expanding and enhancing the knowledge commons" and includes articles providing for access to publicly funded research and government information and a provision that government works should be in the public domain.

A category of government information to which some countries already allow access is material of a legal, judicial or political nature: legislation, case law, and parliamentary proceedings. In 2002 delegates from some Commonwealth countries produced a 'Declaration on Free Access to Law' that asserts, among other things that "(p)ublic legal information is digital common property and should be accessible to all on a non-profit basis and free of charge; …" Anyone who has followed the discussion in this chapter and reads the full declaration will realize that the declaration needs to go into more detail about creating derivative works and using the material commercially.

Tax exempt foundations and not-for-profit educational and research institutions also fund research that produces important information. According to the law in most countries, funders and employers can decide on what terms to release this information. It is understandable that researchers looking for funding may want to include a profit line from intellectual property in their research proposals. Educational institutions also like the idea of using the research done by their staff to produce what some call "third stream" income. It could also be seen as part of academic freedom that academics who work in educational and research institutions are entitled to a say in how their research is released. Access to knowledge advocates could argue that governments should consider whether institutions and funders that do this are really entitled to their tax-free status.

Creative Commons works through Science Commons to encourage the free flow of scientific information. One of the Science Commons projects has drafted model contracts for the transfer of biological material. Another project aims at publishing material that is important for biological research with an open licence. A third project aims at getting peer reviewed journals to publish with open licences and enlisting academics to publish only in journals that do this.

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2.2.5: Concluding Comments

In conclusion it seems worth mentioning two features that most open licences lack: provision for notifying the copyright holder about how material is being used and provision for alternative dispute resolution.

Notification

It is surprising that open licences do not allow an author to require a user, in return for being free to use the author's material, to keep the author informed about what a user does with the material. The African Medical Research Foundation's licence requests this information but it is not a condition of using the material. Drafting such a condition, of course, would have to be done so as not to impose too much of a burden on users. But if it could be done the information would help assess the value of open licence material.

Alternative Dispute Resolution

We have seen the different opinions about what some of the clauses in the CC licences mean. And there has been litigation about the meaning of the GPL. As things stand only a court, possibly even a whole series of courts in different countries, can settle differences of opinion. Given the cost of litigation, it is unlikely that the courts will ever have an opportunity to do this. In 1999 ICANN adopted a Uniform Domain-Name Dispute-Resolution Policy for settling disputes about domain names. There is no reason why there should not be a similar dispute resolution procedure for settling disputes between copyright holders and users about the meaning of open licences.

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CHAPTER OVERVIEW

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SECTION OVERVIEW

3.1: Guiding Principles for Developing Comprehensive and Meaningful Instruction for Individuals with Complex Needs

Author: Sheldon Loman, Portland State University

3.1.1: Guiding Principle 1- Plan with the Individual and Family

3.1.2: Prelude

3.1.3: Guiding Principle 2- Promote Self-Determination throughout the Assessment, Intervention, and Monitoring Process

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3.1.1: Guiding Principle 1- Plan with the Individual and Family

An essential first step to designing and implementing instruction for individuals with disabilities (IWD) is to plan with the individual and their family. Person-centered planning is a process used with IWD and others that is key to implementing supports for the individual (e.g., social workers, speech and language therapists, special educators). The purpose of person-centered planning is to establish positive, collaborative, meaningful, and individualized programs for IWD (Claes, Van Hove, Vandevelvelde, Loon, & Schalock, 2010). There are several person-centered planning models such as Planning Alternative Tomorrows with Hope (PATH; Pearpoint, O'Brien, & Forest, 1993), Personal Futures Planning (O'Brien & Lovett, 1992), McGill Action Planning (Vandercook, York, & Forest, 1989), and the Picture Method (Holburn, Gordon, & Vietze, 2007). All of these models are designed to center the supports and services for IWD with the individual and their families.

Choosing Outcomes and Accommodations for Children (COACH, Giangreco et al., 2011) is a comprehensive, yet practical approach to collaborative instructional planning for IWD who require intensive supports. The COACH process is designed to focus on promoting achievement for IWD within inclusive settings. There are two parts of COACH: Part A guides families and educators to determine a student's educational program; and Part B guides the team to translate the family-identified priorities into goals and objectives. Part A involves a family interview that helps IWD and their families identify valued life outcomes and prioritize learning outcomes within selected curriculum areas. Part A concludes with the student team identifying general supports that will improve access and participation in the student's educational program. These general supports outline accommodations, modifications, and individuals essential to implementing a successful inclusive program for a student. Part B of COACH then guides the team to translate these supports into measurable annual goals and shortterm objectives. Finally, the team delineates a "Program-at-a-glance" that is shared with everyone who supports the student.

A resource for assisting IWD plan their supports and services is the website www.imdetermined.org. The "One-Pager" from this resource is a practical tool that can be used by students and their teams to share strengths, preferences, interests, and needs with new teachers, employers, case managers, and other people who may support the students. A template is provided that allows students to type or handwrite and embed pictures within this one-page document. Examples are provided on this website for how this tool can be used. Overall, the "One-Pager" is a tool that can be used with students to ensure that they are the center of their instructional programming.

Person-centered planning outlines life-long dreams for the individual and plans to help them achieve them. The process brings together the individual, their family, and support-service providers (e.g., special and general educators, social workers, community support providers) to collaborate in designing a cohesive instructional program that addresses the individuals' values. This person-centered team (sometimes called an instructional team) will follow a student along in their program, its members consistently updating one another to improve the outcomes for the individual and their family.

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3.1.2: Prelude

Individuals with complex needs require supports from multiple providers across multiple instructional domains. Designing and implementing effective supports for individuals with complex needs requires intentional committed collaboration from all stakeholders. This chapter introduces guiding principles for designing comprehensive instructional supports for individuals with complex needs that should create a conceptual and practical frame for the successive chapters of this text. Each of these guiding principles is a vast topic with multiple associated texts and resources. Therefore, within this chapter, practical resources are provided to help readers develop their repertoire of tools for designing effective and meaningful supports for individuals with complex needs.

Six Guiding Principles for Developing Comprehensive Supports

1. Plan with the individual and family
2. Promote self-determination throughout the assessment, intervention, and monitoring process
3. Examine the current and future inclusive environments
4. Utilize Universal Design for Learning (UDL) principles in developing modifications and supports within inclusive environments
5. Implement evidence-based practices to individualize instruction
6. Use data to make decisions to improve instruction

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3.1.3: Guiding Principle 2- Promote Self-Determination throughout the Assessment, Intervention, and Monitoring Process

When implementing programs for IWD it is important to seek their perspective on the types and levels of supports they need. However, often times IWD struggle to express their preferences and are not provided with opportunities to engage in activities to promote their self-determination. For educators of IWD, promotion of self-determination is foundational throughout the assessment, intervention, and monitoring process.

Promoting self-determination has become best practice in the education of IWD. Self-determination is a broad construct in which no single practice or package of practices applies. Based on work from Wehmeyer et al. (2011) and Walker et al. (2011), self-determination comprises three dimensions in which an individual needs to develop: (a) causal agency (an individual's control of events), (b) proxy agency (provision of supports and assistance allowing the individual to control events), and (c) opportunities to act upon the environment. These dimensions and specific skills are displayed in Figure 1.3.1 below.

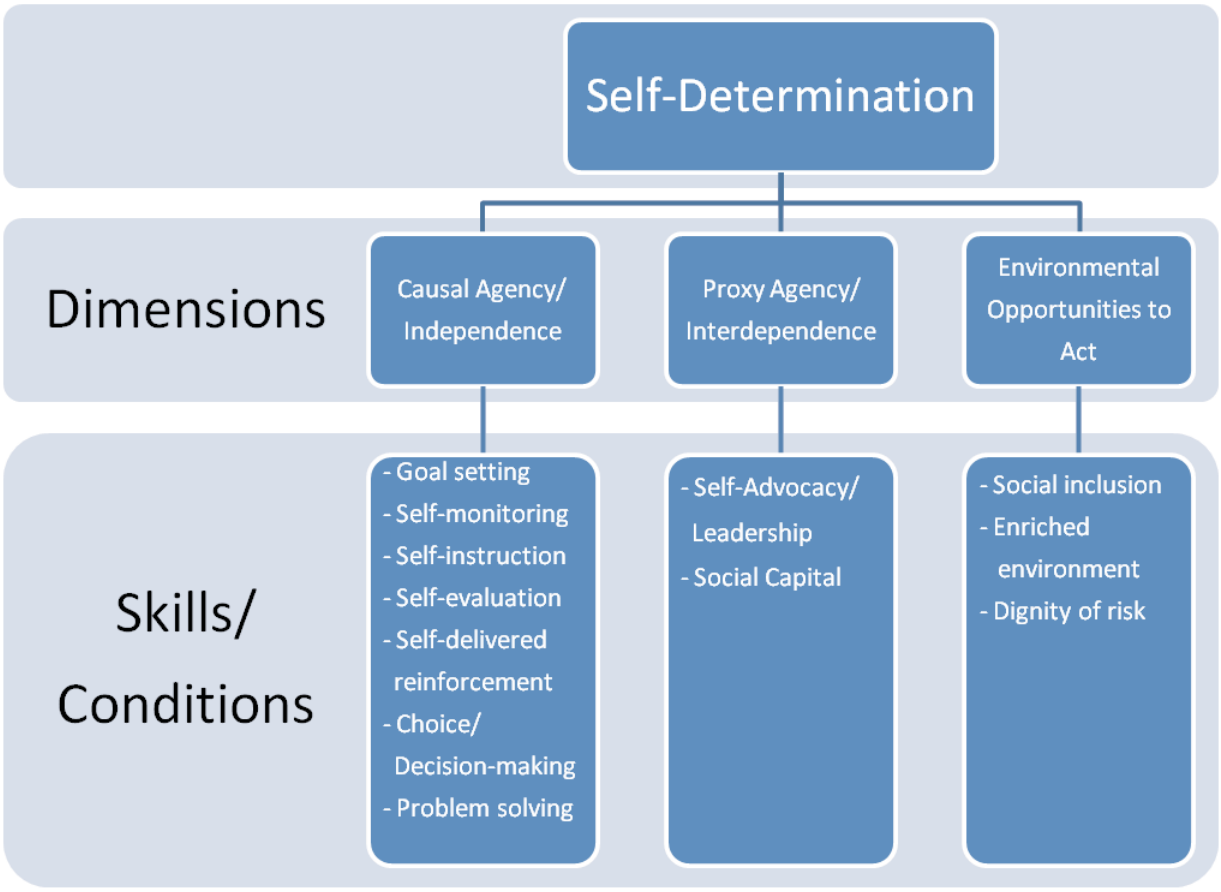


Figure 3.1.3.1: Framework of Self-determination Dimensions and Skills/Conditions
(from Loman et al., 2010)

Preference Assessments

During the assessment process, self-determination can be promoted through the use of preference assessments. Preference assessments include the student in identifying reinforcers as well as identifying meaningful activities and materials. Interviews of significant others regarding a student's preferences are a good starting point. However, it is important to include the individual student in his or her own preference assessment. The use of direct observations of students interacting with different activities and materials is the most reliable way to obtain this information.

Several helpful resources for promoting self-determination are available through the Zarrow Center for Learning Enrichment at the University of Oklahoma (http://www.ou.edu/education/centers-and-partnerships/zarrow.html). The center provides preference-

indicator tools for individuals of all ages:

- Child Preference indicators (www.ouhsc.edu/thecenter/products/documents/ChildPreferenceIndicators_rev1107.pdf),
- Personal Preference indicators (www.ouhsc.edu/thecenter/products/documents/CLLUCEDD_Personal_Preference_Indicators_June%202006.pdf), and
- Employment Support indicators (www.ouhsc.edu/thecenter/products/documents/EmploymentSupportIndicators.pdf).

These tools can assist IWD in identifying preferences and promoting their self-determination.

A systematic preference assessment involves the direct observation of an individual with different stimuli and observing their interactions with the materials or activities. Common methods for this are free-access preference assessments and forced-choice preference assessments. In a free-access preference assessment (shown below in Table 1.3.1), the assessor makes multiple materials or activities that may be preferred by the student readily available. The student's interactions with the materials or activities are recorded to identify the most preferred items. See a sample template below:

Table 1.3.1: Free-Access Preference Assessment Template

Student:	Date Range of Sessions:					
Complete the table below noting how long the student engages with the materials/activities during the session.						
Date:	Item 1:	Item 2:	Item 3:	Item 4:	Item 5:	Item 6:
Total Time Engaged:						

A forced-choice preference assessment involves selecting a specific number of materials or activities and presenting them in pairs in a random fashion. At the conclusion of a forced-choice preference assessment, a hierarchy of preferred materials or activities is determined. An example of a forced-choice template is available at: http://r4strategiesasd.wikispaces.com/file/view/Forced+Choice+Reinf+Assessment.pdf

Self-determination practices

Five practices identified as having evidence for promoting self-determination for IWD (Loman, Vatland, Strickland-Cohen, Horner, & Walker, 2010; Vatland et al., 2011) were: (a) use person-centered planning methods; (b) use teacher-directed instructional strategies; (c) teach students skills needed to self-direct learning; (d) create and maintain a system that involves family supports and family involvement; and (e) organize environments to provide enriched opportunities, supports, models, and resources. In their practice guide, Loman et al. (2010) provide a definition of the practice, level of evidence and social validity, a brief summary of support for the practice, instructions for how to implement the practice, and identified barriers or limitations of the practice.

The promotion of self-determination is critical to the development of an effective and meaningful program for IWD. The practices and procedures presented within this chapter and the remainder of this text should be framed with promoting self-determination in mind.

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3.1.4: Guiding Principle 3- Examine the Current and Future Inclusive Environments

Mapping Objectives to Activities in Inclusive Environments

After planning with the individual and understanding their preferences, the next step to designing an effective inclusive instructional program is to examine the instructional environments. When examining the current and future environments, identify their current goals and objectives within the context of an age-appropriate inclusive instructional setting. A common tool used for this is the Infused Skills Grid (Peak Center Inc., 1999; http://www.cde.state.co.us/cdesped/accommodationsmanual_infusedskillsgrid). The Infused Skills Grid should be completed by inserting the student's current objectives in the horizontal rows. Then, complete the schedule of a typical student's day (it is important that this schedule be based on a same-age peer without a disability). Using the tool, the student's instructional team will identify when the objectives can be met within the typical instructional settings. Usually all objectives can be addressed within at least 90% of the typical schedule. A facilitator of this process, usually a special educator, can help the team think of ways the objectives can be met within inclusive environments. If an objective cannot be met within the inclusive environments, the facilitator should ask the team if the objectives should be revised to be more appropriate for a student within this setting.

Identifying Strengths and Barriers within Inclusive Settings

A daily schedule analysis (sometimes referred to as an ecological inventory; Table 1.4.1) is used to analyze the schedule and instructional environments within typical settings. Similar to the Infused Skills Grid, the first step in completing this tool is to outline the classes and environments the student would attend if he or she did not have a disability. Following the columns in the daily schedule analysis tool, specify for this class/environment: (a) the activities that all students engage in; (b) natural supports that already exist for all students; (c) target skills that the focus student needs to develop in order to participate in these activities; and (d) recommended accommodations and modifications to promote participation for the focus student. A video example of a completed daily schedule analysis with an explanation is provided in the following link: my.brainshark.com/Daily-Schedule-Analysis-Simulation-1-39562592

Breaking Down Tasks within Inclusive Environments

The daily schedule analysis provides a broad picture of instructional targets and modifications needed for an individual student. To break down specific target skills needed to be successful in inclusive environments, a task analysis should be conducted. A task analysis involves breaking down the steps of a routine or task. These individual steps are then analyzed for variations in cues and prompts to determine how to provide instruction that promotes generalization of the skills.

An example of a completed task-analysis form is provided below (Figure 1.4.1). Using this task-analysis form, identify a logical step sequence for completing the routine. Make sure to provide brief, but specific information in the step to prompt the learner. For example, instead of "student will turn the door knob to the right" state "turn the door knob." Using this consistent language will help those implementing the plan identify verbal prompts to use with a student and help the student identify the relevant features to cue their behavior. Next, identification of stimuli that could be varied for each step should be notated in the adjacent column. Finally, data codes from 0 (no opportunity) to 1 (most intrusive level of prompting; e.g., physical prompting) to 2 (less-intrusive level of prompting; e.g., gestural prompting) to 3 (least intrusive level of prompting; e.g., verbal prompting) to 4 (independent) are used to empirically document student progress. A second sheet (Table 1.4.2) is provided to allow for anecdotal and qualitative data collection of student and teacher performance within the task. For more information and examples of task analyses, go to the National Professional Development Center on Autism Spectrum Disorders: autismpdc.fpg.unc.edu/content/task-analysis.

Table 1.4.1: Daily Schedule Analysis Template

Domain	**School**	**Activities (All students experience)**	**Natural Supports (Supports available for all students)**	**Target Skills (For target student during this subject; highlight priority skills)**	**Possible Adaptations/Modifications (Consider Assistive Technology, Augmentative Communication)**
Environments	**Grade level:**				
Sub-environments→	Subject 1 (e.g., homeroom,				

	language arts)				
	Subject 2				
	Subject 3				
	Hallway				
	Bathroom				
	Cafeteria				
	Other				

Task Analysis Data Tracking System for a Functional Routine

Student: _____ Routine: ___Hair Brushing_____ Setting(s):__Bathroom, Locker room_

Days of Week/Time of Day: _____Data Collection Date Range: _____ to _____

		Baseline			Intervention								
Step	Features to vary (to promote generalization) Note features included for each step	12/5	12/6	12/7	12/9	12/10	12/11	12/12	12/13	12/16	12/17	12/18	% Indep end.
11. Final Step: Put Brush Away	A. Location B. Brush Type C. Time of day	4	4	4	4	4	4	4	4	4	4	4	100%
10. Check Hair for Neatness	A.	2	2	2	4	4	4	4	4	4	4	4	73%
9. Brush Left Back of Head	A., B., C. D. Staff supporting	1	1	1	3	4	4	3	3	4	4	4	64%
8. Brush Left Side of Head	A, B, C, D	1	1	1	3	3	3	3	3	3	3	4	9%
7. Brush Front	A, B, C, D	1	1	1	3	3	3	3	3	3	3	4	9%
6. Brush Right Side of Head	A, B, C, D	1	1	1	3	3	3	3	3	3	4	4	18%
5. Brush Right Back of Head	A, B, C, D	1	1	1	3	3	3	3	4	4	4	4	36%
4. Pick up brush	A, B, C, D	2	2	2	3	3	3	4	4	4	4	4	45%
3. Select Desired Materials	A, B, C, D	2	2	2	3	3	3	4	4	4	4	4	45%
2. Locate Brushing materials	A, B, C, D	2	2	2	3	3	3	3	4	4	4	4	36%
1. **Initial Step:** Initiate Brushing	A, B, C, D	2	2	2	3	4	4	4	4	4	4	4	63%
Staff/Observer Initials		SL	SL	SL	SL	SL	SL	SL	SL	SL	SL	SL	
Total Completion Time (in Minutes):		5	6	5	5	4	4	4	3	3	2	2	
Total Steps Independent - Data Code: 4 (Circle & graph)		1	1	2	2	4	4	5	7	8	9	11	
Total Steps – Verbal & Gesture Data Code: 3		0	0	9	9	7	7	6	4	3	2	0	
Total Steps Partial Physical Data Code: 2		5	5	0	0	0	0	0	0	0	0	0	
Total Steps Fully Physical - Data Code: 1		5	4	0	0	0	0	0	0	0	0	0	
Total Steps w/ No opportunity- Data Code: 0		0	0	0	0	0	0	0	0	0	0	0	

Qualitative Data Collection (On Back)

Figure 3.1.4.1: Task Analysis Tracking Form.

Table 1.4.2: Qualitative Data Collection Form to Accompany the Task Analysis Form

Qualitative Data Collection

	Focus Student Performance	Variables (Planned or unplanned) influencing student performance	Considerations for prompting, supports or adjustments	Instructor practices
Date: Baseline #1				
Date: Baseline #2				
Date: Baseline #3				
Date: Intervention				
Date: Intervention				
Date: Intervention				
Date: Intervention				
Date: Intervention				

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3.1.5: Guiding Principle 4- Utilize Universal Design for Learning Principles in Developing Modifications and Supports

Planning instruction for IWD requires collaboration between general and special educators (e.g., special education, speech and language therapist, occupational therapist). This team of educators should be guided by the information compiled from the person-centered planning process, student preference assessments, and assessment of the instructional environments. All of this information will be utilized to embed a student's individualized instruction within the instruction of the Common Core State Standards and College Career Readiness Standards within the general education settings.

The principles of Universal Design for Learning (UDL; CAST, 2011) create a framework for collaborative creation of curricula that involves both general and special educators. A short You-Tube video presenting UDL from the Center for Applied Special Technology demonstrates this framework (CAST; https://www.youtube.com/watch?v=bDvKnY0g6e4). The primary UDL principles for providing individuals with multiple means of representation, expression, and engagement lay a foundation for designing Common Core units and lessons that promote the participation of all learners.

Developing a unit plan for Common Core content areas that address IWD in general-education classrooms takes a coordinated effort from the instructional team. Falco (2014; modified from Tamarkin, n.d.) created a unit/lesson redesign worksheet (Table 1.5.1) that can be used by instructional teams to ensure they are incorporating UDL into their lessons. Within this worksheet, the team outlines the Common Core state standards and lesson objectives that are being addressed. Then, the team outlines how students will demonstrate their learning and what they currently do to teach these skills. In the adjacent columns of the worksheet, instructional teams can then identify ways they may augment their instruction to ensure that the principles of UDL are incorporated in their lessons. View this video clip to see how a biology teacher has utilized UDL within their instruction: https://www.youtube.com/watch?v=G18AzLXhEdA&feature=relmfu

Table 1.5.1: Unit/Lesson Re-Design Worksheet. Falco, 2014 (Adapted from Tamarkin, D. (n.d.).)

Unit/Lesson Re-Design Worksheet (Example)

Course/Lesson Biology 1 **Instructor/s** Dawn **Date** Nov. 6, 2014

Key Goals/Outcomes (Usually tied to CCSS)	**What I Want Students to Do to Demonstrate Learning**	**What I Do Now**	**Applying UDL: Representation of Content**	**Applying UDL: Student Actions/Expression**	**Applying UDL: Student Engagement/Motivation**
Recognize the components of a cell	Show the components of a cell	Give students opportunities to look at cells through a microscope and draw cell and its parts	Provide manipulatives to represent cell parts	Students use manipulatives to show cell parts and use tabletop models to assist in drawing	Students enjoy manipulating the models; More success in drawing
Study content following class Use lab equipment accurately & safely	Take notes & review notes to learn parts of cell & their functions Use the microscope	Lecture & draw cell models; Expect students to review their own notes Expect students to use microscope alone or with one partner and to help their partners; spend more time with students with special needs	Use interactive white board to demonstrate drawing & provide good notes	Use teacher's notes from interactive white board & review own & other students' notes posted online All students in groups of three and all students help their partners	Students have accurate notes and drawings to review Students share responsibility for helping partners

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3.1.6: Guiding Principle 5- Implement Evidence-Based Practices to Individualize Instruction

Implementation of effective instructional practices is the critical step that brings all of the guiding principles together. In 2014, the National Professional Development Center on Autism Spectrum Disorders (NPDC) has updated their autism intervention literature review on evidence-based practices for children, youth, and young adults with Autism Spectrum Disorders (ASD). In their review they identified 27 practices that were considered "evidence-based." The document in its entirety is provided here: http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf

The NPDC has also developed evidence-based practice (EBP) briefs for 24 of the identified EBPs available here: autismpdc.fpg.unc.edu/content/briefs. These briefs provide a description of each of the practices, the evidence supporting the use of the practices, and step-by-step instructions for implementing those practices. Additionally, the NPDC and the Ohio Center for Autism and Low Incidence (OCALI) have developed online modules for understanding each of these EBPs. Click on the following link and register for a free account to access this resource: http://www.autisminternetmodules.org/

Ensuring that EBPs are embedded in inclusive environments is a challenge for all educators. Scheduling and collaboration with the instructional team using the tools already presented in this chapter will assist with this process. To further assist in the process, Loman (2014) has framed a number of the EBPs within the UDL framework (Table 1.6.1). This graphic may be helpful for instructional teams to determine how to best support IWD in the Common Core content areas.

Table 1.6.1: Evidence-based Practices for Individuals with Autism by Universal Design for Learning Principle

Representation	Expression	Engagement
Visual Strategies (Picture Symbols/Schedules)	Augmentative Communication	Social Narratives/Power Cards
Video Modeling	Functional Communication Training	Reinforcement
Modeling/Prompting	Time Delay	Peer-mediated intervention
Naturalistic Interventions	Discrete Trial Training	Self-management
Task Analysis-Chaining	Pivotal Response Training	Naturalistic Interventions
Structured Work Systems/Activities	Response Interruption	

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3.1.7: Guiding Principle 6- Use Data to Make Decisions to Improve Instruction

Every step of the process in designing and implementing a comprehensive instructional program for IWD relies on the use of data. A number of tools presented throughout this chapter may be used as sources of data to outline effective supports for IWD. The COACH process (Giangreco, Cloninger, & Iverson, 2011) provides valuable information that brings together information from individuals, their families, and school professionals. These data are used to outline general supports and annual goals and objectives for students. Preference assessments are another good source of data for better understanding the learner and how to engage them throughout the learning process. Additionally, the use of the daily schedule analysis and task analyses are critical to guiding meaningful and effective instruction. Furthermore, data from individualized plans of support such as behavior-support plans or curriculum-based measures within the classroom will provide essential information to monitor the progress of IWD.

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3.1.8: Conclusion

The six guiding principles presented in this chapter frame the process of supporting IWD in inclusive settings. Led in partnership with the individual and their family (ideally the student should lead this meeting), instructional teams of individuals with complex support needs should consistently review data at least quarterly to ensure all stakeholders are synergistically heading in a positive direction. Data from Individualized Education Program (IEP) goals should be discussed as well as how the student is engaging in the general-education curriculum. These team meetings should always be guided by an agenda that presents current data and seeks to remove barriers to success for the student. In order for these meetings to be effective, team members should consistently assume the following roles: Recorder (types and distributes meeting minutes), Data Analyst (compiles and presents data of student progress), Time Keeper (ensures topics are addressed in a timely fashion), and Facilitator (keeps the meeting running; ideally the student). An individual student meeting agenda template is provided below (Figure 1.8.1).

Individual Student Meeting Agenda Template

Student: _____ **Recorder:**_____

Data Analyst: _____ **Time Keeper:** _____

Facilitator (if not the student): _____

Date: ___/___/____

Team Members Present: _____

I. Review agenda, determine whether changes are needed (2 minutes)

II. Review task list from previous meeting, document status of tasks (10 minutes)

Who	What	When	Status
			Not In Done Not started progress Needed
			Not In Done Not started progress Needed
			Not In Done Not started progress Needed
			Not In Done Not started progress Needed

III. Progress summary: Presentation of Current Data (15 minutes)

a. Goals being met. Celebration!

b. Goals not being met or not yet addressed

1. Determine problem and next steps

-Possible problems: fidelity, intervention needs to be modified, additional supports or technology are required

-Possible decisions: Meet with teachers, change intervention, acquire technology or supports, conduct assessment

Problem	Decision	By Whom & byWhen?

IV. Upcoming Activities/ Changes (15 minutes)

Upcoming Activity	*Concerns*	*Decisions*	*By Whom & When?*

Next Meeting Date: _____

Figure 3.1.8.1: Individual Student Meeting Template. Ideally to be led by the student at least quarterly.

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CHAPTER OVERVIEW

4: Module 04- Digital Citizenship and Media Literacy

4.1: Digital literacies and the skills of the digital age
4.2: Literacy in the Digital Age- From traditional to Digital to Mobile Digital Literacies
4.3: The Digital Divide and the lack Financial Literacy among First Generation
4.4: Literacy in the Digital Age- From traditional to Digital to Mobile Digital Literacies
4.5: Digital literacies and the skills of the digital age

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4.1: Digital literacies and the skills of the digital age

Abstract – *This chapter is intended to provide a framework and understanding of digital literacy, what it is and why it is important. The following pages explore the roots of digital literacy, its relationship to language literacy and its role in 21st century life.*

Introduction

Unlike previous generations, learning in the digital age is marked by the use of rapidly evolving technology, a deluge of information and a highly networked global community (Dede, 2010). In such a dynamic environment, learners need skills beyond the basic cognitive ability to consume and process language. In other words: To understand what the characteristics of the digital age, and of digital learners, means for how people learn in this new and changing landscape, one may turn to the evolving discussion of literacy or, as one might say now, of digital literacy. The history of literacy contextualizes digital literacy and illustrates changes in literacy over time. By looking at literacy as a historical phenomenon, the characteristics of which have evolved over time, we can glean the fundamental characteristics of the digital age. Those characteristics in turn illuminate the skills needed in order to take advantage of digital environments. The following discussion is an overview of digital literacy, its essential components and why it is important for learning in a digital age.

Moving from Literacy to Digital Literacy

Literacy refers to the ability of people to read and write (UNESCO, 2017). Reading and writing then, is about encoding and decoding information between written symbols and sound (Resnick, 1983; Tyner, 1998). More specifically, literacy is the ability to understand the relationship between sounds and written words such that one may read, say and understand them (UNESCO, 2004; Vlieghe, 2015). Literacy is often considered a skill or competency and is often referred to as such. Children and adults alike can spend years developing the appropriate skills for encoding and decoding information.

Over the course of thousands of years, literacy has become much more common and widespread with a global literacy rate ranging from 81% to 90% depending on age and gender (UNESCO, 2016). From a time when literacy was the domain of an elite few, it has grown to include huge swaths of the global population. There are a number of reasons for this, not the least of which are some of the advantages the written word can provide. Kaestle, (1985) tells us that “literacy makes it possible to preserve information as a snapshot in time, allows for recording, tracking and remembering information, and sharing information more easily across distances among others” (p. 16). In short, literacy led “to the replacement of myth by history and the replacement of magic by skepticism and science. Writing allowed bureaucracy, accounting, and legal systems with universal rules and has replaced face-to-face governance with depersonalized administration” (Kaestle, 1985, p. 16). This is not to place a value judgement on the characteristics of literacy but rather to explain some of the many reasons why it spread.

There are, however, other reasons for the spread of literacy. In England, throughout the middle ages literacy grew in part, because people who acquired literacy skills were able to parlay those skills into work with more pay and social advantages (Clanchy, 1983). The great revolutions of the 19th and 20th centuries also relied on leaders who could write and compatriots who could read as a way to spread new ideas beyond the street corners and public gatherings of Paris, Berlin, and Vienna. Literacy was perceived as necessary for spreading information to large numbers of people. In the 1970’s Paulo Freire insisted that literacy was vital for people to participate in their own governance and civic life (Tyner, 1998). His classic “Pedagogy of the Oppressed” begins from the premise that bringing the traditional illiterate and uneducated into learning situations as partners with their teachers awakens the critical conscience necessary as a foundation for action to foment change (Freire, 1973). UNESCO (2004) also acknowledges the role that literacy plays in enabling populations to effect change and achieve social justice aims. They speak even more broadly, moving beyond the conditions necessary for revolution, contending that literacy is a fundamental right of every human being, providing employment opportunities, and the fundamental skills necessary to accrue greater wealth and improve one’s quality of life.

Although the benefits of literacy were a driving force in its spread, technological advances also enabled the spread of literacy to greater and greater numbers of people. From stamped tokens, tally sticks and clay tablets, to ancient scrolls, handwritten volumes, the printing press, typewriters, and finally computers, technology is largely responsible for driving the evolution of literacy into the particular forms of encoding and decoding information associated with the digital age. Technology has made it possible for literacy to move from the hands of the few to the hands of the masses and to morph into a digital environment with characteristics extending far beyond anything that has been seen before.

Not only did computers and electronic technology deliver literacy into the hands of many but also created an environment that made it possible to store vast amounts of information. Books and libraries led the way to making information easily available to the public, but within the age of computers and the internet the volume of accessible information is larger than ever, more readily available than ever, and changing more quickly than ever before. In the early 21st century, technology continues to develop more quickly than at any time in the past creating an environment that is constantly changing. These changes contribute to the need for different skills beyond traditional literacy skills also called *new media literacy* (Jenkins, 2018). For a short video on the reasons why digital literacy is important visit "The New Media Literacies" located on YouTube.com and created by the research team at Project New Media Literacies.

Literacy in the Digital Age

If literacy involves the skills of reading and writing, digital literacy requires the ability to extend those skills in order to effectively take advantage of the digital world (ALA, 2013). More general definitions express digital literacy as the ability to read and understand information from digital sources as well as to create information in various digital formats (Bawden, 2008; Gilster, 1997; Tyner, 1998; UNESCO, 2004). Developing digital skills allows digital learners to manage a vast array of rapidly changing information and is key to both learning and working in an evolving digital landscape (Dede, 2010; Koltay, 2011; Mohammadyari & Singh, 2015). As such, it is important for people to develop certain competencies specifically for handling digital content.

People who adapt well to the digital world exhibit characteristics enabling them to develop and maintain digital literacy skills. Lifelong learning is a key characteristic necessary for handling rapid changes in technology and information and thus, critical to digital literacy. Successful digital learners have a high level of self-motivation, a desire for active modes of learning and they exercise the ability to learn how to learn. Maintaining and learning new technical skills also benefits learners in the digital age and an attitude of exploration and play will help learners stay engaged and energized in a world where speed of change and volume of information could otherwise become overwhelming (Dede, 2010; Jenkins, 2018; Visser, 2012). A final characteristic of a digital learner includes the ability to engage in a global network with a greater awareness of one's place and audience in that network. Together, these characteristics of the digital age guide us in understanding what traits a learner will require to be successful in the digital environment. The following section will help understand what lies at the intersection of digital skills and traits of successful digital learners by reviewing existing digital literacy frameworks.

Reviewing Existing Frameworks for Digital Literacy/ies

Digital literacy is alternately described as complicated, confusing, too broad to be meaningful and always changing (Heitin, 2016; Pangrazio, 2014; Tyner, 1998; Williams, 2006). Due to this confusion, some feel it best to completely avoid the term digital literacy altogether and instead opt for the terms such as digital competencies (Buckingham, 2006), 21st century skills (Williamson, 2011) or digital skills (Heitin, 2016). Another way to sort out the confusion is to look at digital literacy as multiple literacies (Buckingham, 2006; Lankshear & Knobel, 2008; UNESCO, 2004)

Here, I take the latter approach and look at digital literacy as a collection of literacies each of which play a significant role in learning in a digital world. Ng (2012), operationalizes digital literacy as a framework of multiple, specific competencies which, when combined, form a cohesive collection of skills. By taking this approach, we link the characteristics of the digital environment as well as those of the digital learner not to a single digital skill but rather a set of digital literacy practices. In this way, we can consider the various skills needed to navigate the digital world in an organized and consistent manner.

Ng (2012) proposes a three-part schema for discussing the overlapping functional characteristics of a digitally competent person: technical, cognitive, and social (see Figure 1).

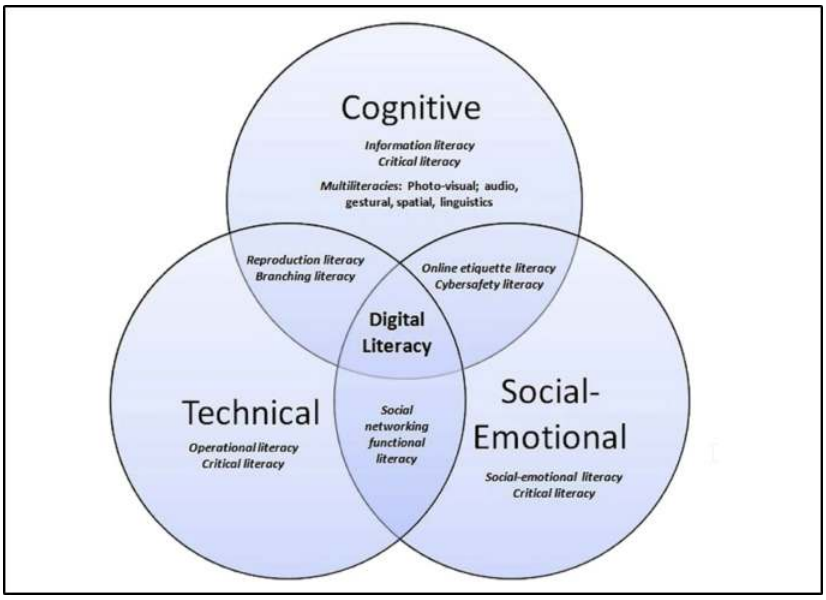


Figure 1. Underlying foundation of digital literacy includes technical, cognitive and social skills (Ng, 2012).

Technical literacy, also referred to as operational literacy, refers to the mastery of technical skills and tasks required to access and work with digital technology such as how to operate a computer; use a mouse and keyboard; open software; cut, copy and paste data and files, acquire an internet connection and so on (Lankshear & Knobel, 2008). The cognitive area of digital literacy focuses on activities such as critical thinking, problem solving and decision making (Williamson, 2011) and includes the ability to "evaluate and apply new knowledge gained from digital environments"(Jones-Kavalier & Flannigan, 2006, p. 5). The third of Ng's three categories – social literacies – covers a wide range of activities which together constitute the ability to communicate in a digital environment both socially and professionally, understand cyber security, follow "netiquette" protocols, and navigate discussions with care so as not to misrepresent or create misunderstandings (Ng, 2012). Of particular note, Ng captures the essence of digital literacy by showing how digital literacy exists at the intersection of the technical, cognitive and social aspects of literacy which are referred to as dimensions. Ng's framework is not, however, a digital literacy framework itself. Instead it provides a vehicle for exploring the various components of digital literacy at a conceptual level while remaining clear that the individual skills are at all times connected to and dependent upon each other.

There are a number of organizations that publish their own framework for digital literacies including the International Society for Technology in Education ICT Skills (ISTE), the American Association of College and Universities (AACU), the Organization for Economic Cooperation and Development (OECD), the American Library Association (ALA), and the Partnership for 21st Century Skills among others (Dede, 2010). The digital frameworks exhibit many similarities, and a few differences. There are some differences in the terminology and organization of these frameworks, but they all include similar skills. What follows is a brief overview of the different digital frameworks. See Figure 2 for a composite of these frameworks.

Partnership for 21st Century Skills (P21)	• Core subjects • 21st century content • Learning and thinking skills • ICT Literacy
American Association of College and Universities	• Knowledge of Human Cultures and the Physical and Natural World • Intellectual and Practical Skills • Personal and Social Responsibility
International Society for Technology in Education ICT Skills	• Creativity and innovation • Communication and Collaboration • Research and Information Fluency • Critical Thinking, Problem Solving, and Decision Making
Educational Testing Service	• Access • Manage • Integrate • Evaluate
Society of College, National, and University Libraries (UK)	• Constructing strategies for locating information • Locating and accessing the information sought • Comparing and evaluating information obtained from different sources • Organizing, applying and communicating information • Synthesizing and building upon information
American Library Association	• Finding • Understanding • Evaluating • Creating

Figure 2. Major Frameworks for 21st Century Skills (American Library Association, 2013; Dede, 2010; SCONUL, 2016; Vockley & Lang, 2008)

Each of the frameworks come from a slightly different angle and will at times reflect the background from which they come. The American Library Association (ALA) framework evolved out of the information literacy tradition of libraries, while the American Association of College and Universities (AACU) and the Society of College and University Libraries (SOCNUL) evolved from higher education perspective, the Partnership for 21st century learning addresses K-12 education, and the ISTE is steeped in a more technical tradition. Even with these different areas of focus the components of each framework are strikingly similar although some in more detail than others. Three of the six specifically address the skills necessary for accessing, searching and finding information in a digital environment while the other three have broader categories in which one might expect to find these skills including, research and information fluency, intellectual skills, and ICT literacy. Cognitive skills required for digital literacy are also covered by all of the frameworks in varying degrees of specificity. Among them one will find references to evaluating, understanding, creating, integrating, synthesizing, creativity and innovation. Finally, four of the six digital frameworks pay homage to the necessity of solid communication skills. They are in turn, referred to as life skills, personal and social responsibility, communication, collaboration, digital citizenship and collective intelligence.

What seems oddly missing from this list of skills is the technical component which only appears explicitly in the ISTE list of skills. The partnership for 21st century learning uses ICT literacy as a designation for the ability to use technology and the ALA, in discussing its framework, makes it clear that technical proficiency is a foundational requirement for digital literacy skills. Even with these references to technical skills the digital literacy frameworks are overwhelmingly partial to the cognitive and social focus of digital skills and technical proficiency tends to be glossed over compared to the other dimensions. Even though technical skills receive relatively little attention by comparison we will assume for this discussion, technical skills are a prerequisite to the other digital skills, and we will look more carefully at each of them in the next section.

To fully understand the many digital literacies, we will use the ALA framework as a point of reference for further discussion using the other frameworks and other materials to further elucidate each skill area. The ALA framework is laid out in terms of basic functions with enough specificity to make it easy to understand and remember but broad enough to cover a wide range of skills. The ALA framework includes the following areas:

- Finding,
- Understanding,
- Evaluating,
- Creating, and
- Communicating
  (American Library Association, 2013).

Finding

Finding information in a digital environment represents a significant departure from the way human beings have searched for information for centuries. The learner must abandon older linear or sequential approaches to finding information such as reading a book, using a card catalog, index or table of contents and instead use lateral approaches like natural language searches, hypermedia text, keywords, search engines, online databases and so on (Dede, 2010; Eshet, 2002). The shift from sequential to lateral involves developing the ability to construct meaningful search parameters (SCONUL, 2016) whereas before, finding the information would have meant simply looking up page numbers based on an index or sorting through a card catalog. Although finding information may depend to some degree on the search tool being used (library, internet search engine, online database, etc.) the search results also depend on how well a person is able to generate appropriate keywords and construct useful Boolean searches. Failure in these two areas could easily return too many results to be helpful, vague or generic results, or potentially no useful results at all (Hangen, 2015).

Not immediately obvious, but part of the challenge of finding information is the ability to manage the results. Because there is so much data, changing so quickly, in so many different formats it can be challenging to organize and store it in such a way as to be useful. SCONUL (2016) talks about this as the ability to organize, store, manage and cite digital resources while the Educational Testing Service also specifically mentions the skills to access and manage information. Some ways to accomplish these tasks is through the use of social bookmarking tools such as Diigo, clipping and organizing software such as Evernote and OneNote, and bibliographic software. Many sites, such as YouTube allow individuals with an account to bookmark videos as well as create channels or collections of videos for specific topics or uses. Other websites have similar features.

Understanding

Understanding in the context of digital literacy perhaps most closely resembles traditional literacy in so much as it too, is the ability to read and interpret text (Jones-Kavalier & Flannigan, 2006). In the digital age, however, the ability to read and understand extends much further than text alone. For example, searches may return results with any combination of text, video, sound, and audio as well as still and moving pictures. As the internet has evolved, there have evolved a whole host of visual languages such as moving images, emoticons, icons, data visualizations, videos and combinations of all of the above. Lankshear & Knoble, (2008) refer to these modes of communication as “post typographic textual practice”. Understanding the variety of modes of digital material may also be referred to as multimedia literacy (Jones-Kavalier & Flannigan, 2006), visual literacy (Tyner, 1998), and digital literacy (Buckingham, 2006).

Evaluating

Evaluating digital media requires competencies ranging from evaluating the importance of a piece of information to determine its accuracy and its source. Evaluating information is not new to the digital age, but the nature of digital information can make it more difficult to understand who the source of information is and whether it can be trusted (Jenkins, 2018). When there is abundant and rapidly changing data across heavily populated networks, anyone with access can generate information online, making decisions about its authenticity, trustworthiness, relevance, and significance daunting. Learning evaluative digital skills means learning to ask questions about who is writing the information, why they are writing it, and who the intended audience is (Buckingham, 2006). Developing critical thinking skills is part of the literacy of evaluating and assessing the suitability for the use of a specific piece of information (SCONUL, 2016).

Looking for secondary sources of information can help confirm the authenticity and accuracy of online data and researching the credentials and affiliations of the author is another way to find out more about whether an article is trustworthy or valid. One may find other places the author has been published and verify they are legitimate. Sometimes one may be able to review affiliated

organizations to attest to the expertise of the author such finding out where an employee works if they are a member of a professional organization or a leading researcher in a given field. All of these provide essential clues for use in evaluating information online.

Creating

Creating in the digital world makes explicit the production of knowledge and ideas in digital formats. While writing is a critical component of traditional literacy, it is not the only creative tool in the digital toolbox. Other tools are available and include creative activities such as podcasting, making audio-visual presentations, building data visualizations, 3D printing, writing blogs and new tools that haven't even been thought of yet. In short, all formats in which digital information may be consumed, a digitally literate individual will also want to be able to use in the creation of a product. A key component of creating with digital tools is understanding what constitutes fair use and what is considered plagiarism. While this is not new to the digital age, it may be more challenging to find the line between copying and extending someone else's work.

In part, the reason for the increased difficulty of finding the line between plagiarism and new work is the "cut and paste culture" of the internet referred to as "reproduction literacy" (Eshet 2002, p.4) also referred to as appropriation in Jenkins' New Media Literacies (Jenkins, 2018). The question is, what can one change and how much can one change work without being considered copying? This skill requires the ability to think critically, evaluate a work and make appropriate decisions. There are tools and information to help understand and find those answers such as the creative commons. Learning about these resources and learning how to use them is part of this digital literacy.

Communicating

Communicating is the final category of digital skills in the ALA digital framework. The capacity to connect with individuals all over the world creates unique opportunities for learning and sharing information for which developing digital communication skills is vital. Some of the skills required for communicating in a digital environment include digital citizenship, collaboration, and cultural awareness. This is not to say that one does not need to develop communication skills outside of the digital environment but that the skills required for digital communication go beyond what is required in a non-digital environment. Most of us are adept at personal, face to face communication but digital communication needs the ability to engage in asynchronous environments such as email, online forums, blogs and social media platforms where what we say can't always be deleted but can be easily misinterpreted. Add that to an environment where people number in the millions and the opportunities for misunderstandings and cultural miscues are much more likely.

The communication category of digital literacies covers an extensive array of skills above and beyond what one might need for face to face interactions. It includes competencies around ethical and moral behavior, responsible communication for engagement in social and civic activities (Adam Becker et al., 2017), an awareness of audience and an ability to evaluate the potential impact of one's actions online. It also includes skills for handling privacy and security in online environments. These activities fall into two main categories of activity including digital citizenship and collaboration.

Digital citizenship refers to one's ability to interact effectively in the digital world. Part of this skill is good manners, often referred to as "netiquette. There is a level of context which is often missing in digital communication due to physical distance, lack of personal familiarity with people online and the sheer volume of people who may come in contact with our words. People who know us well may understand exactly what we mean when we say something sarcastic or ironic, but those and other vocal and facial cues are missing in most digital communication making it more likely we will be misunderstood. Also, we are also more likely to misunderstand or be misunderstood if we remain unaware of cultural differences amongst people online. So, digital citizenship includes an awareness of who we are, what we intend to say and how it might be perceived by other people we do not know (Buckingham, 2006). It is also a process of learning to communicate clearly and in ways that help others understand what we mean.

Another key digital skill is collaboration, and it is essential for effective participation in digital projects via the internet. The internet allows people to engage with others we may never see in person and work towards common goals be they social, civic or business oriented. Creating a community and working together requires a degree of trust and familiarity that can be difficult to build given the physical distance between participants. Greater awareness must be paid to inclusive behavior, and more explicit efforts need to be made to make up for perceived or actual distance and disconnectedness. So, while the promise of digital technology to connect people is impressive it is not necessarily an automatic transition, and it requires new skills.

Parting thoughts.

It is clear from our previous discussion of digital literacy that technology and technical skills underpin every other digital skill. A failure to understand hardware, software, the nature of the internet, cloud-based technologies and an inability to learn new concepts and tools going forward handicaps one's ability to engage with the cognitive and social literacies. While there are sometimes tacit references to technical skills and ability, extant digital literacy frameworks tend to focus more on the cognitive and social aspects of digital environments. There is an implied sense that once technical skills are learned, we the digitally literate person can forget about them and move on to the other skills. Given the rapid pace of technological change in the last 40 years, however, anyone working in a digital environment would be well advised to keep in mind that technical concepts and tools continue to develop. It does not seem likely that we will ever reach a point where people can simply take technological skills for granted and to do so would undermine our ability to address the other digital skills.

Another way to think of this is to recognize that no matter what the skill, none of them operate independently of one another. Whether searching, creating, evaluating, understanding or communicating, it is a combination of skills (or literacies) that allow us to accomplish our goals. Thinking critically, and evaluating information and sources leads to sound decision-making. Understanding and synthesizing information is necessary for creating and again the technical tools are necessary for completing the product. Finding information is of little use if one is unable to analyze its usefulness and creating a great video or podcast will not mean much if one is unable to navigate social and professional networks to communicate those works to others. If only understood in isolation, digital literacies have little meaning and can be of little use in approaching digital environments.

Ng's (2012) conceptual framework reminds us that digital literacy is that space where technical, cognitive and social literacies overlap. A digital skill is not the same thing as digital literacy but the two are fully intwined. Acquiring digital skills is only the beginning of a study of digital literacies, however, and it would be a mistake to stop here. Furthermore, digital literacies span multiple areas including both the cognitive and the social. The real value of digital literacy lies in understanding the synergistic effect of individual digital literacy skills integrated with sets of competencies that enable one to work effectively in the digital world.

Learning Activities.

Literacy Narratives are stories about reading and composing in any form or context. They often include poignant memories that involve a personal experience with literacy. Digital literacy narratives can sometimes be categorized as narratives that focus on how the writer came to understand the importance of technology in his/her life or teaching pedagogy. More often, they are simply narratives that use a medium beyond the print-based essay to tell the story.

Kairos: A Journal of Rhetoric, Technology, and Pedagogy, 20(1), available at http://kairos.technorhetoric.net/20.1/praxis/bourelle-et-al

1. Combining both aspects of the genre, write a piece based on your technological literacy, choosing a medium you feel best conveys the message you want to share with your audience.
2. Find and read 2-4 literacy narratives online that emphasize the use of technology and write a short reflection that discusses the main digital literacies used, summarizes the main points made and describes the elements you felt were most important. Also, describe any digital literacy skills you utilized to complete the assignment.
3. Create your literacy narrative that tells the story of a significant experience of your own with digital literacy. Use a multi-modal tool that includes audio and images or video. Share with your classmates and discuss the most important ideas you noticed in others' narratives.
4. Compare two of the literacy frameworks in Figure 2. How are they alike? How are they different? Do you like one better than the other? Why or Why not?

Resources.

1. Multi-Media Resources about Digital Literacy
   - Digital Literacy and why it matters – https://www.youtube.com/watch?v=p2k3C-iB88w
   - The essential elements of digital literacies https://www.youtube.com/watch?v=A8yQPoTcZ78
   - What is a Literacy Narrative? https://www.youtube.com/watch?v=_Mhl2j-cpZo
   - Benji Bissman's computer literacy narrative – http://daln.osu.edu/handle/2374.DALN/2327
2. Digital Literacy Standards
   - Global Digital Literacy Council

- International Society for Technology in Education

3. Literacy Resources and Training
   - Information and Communication Technologies
4. Resource Library
   - Education Development Center, Inc.
5. Visual Literacy Resources
   - International Visual Literacy Association
6. Digital Literacy Fundamentals
   - http://mediasmarts.ca/digital-media-literacy-fundamentals/digital-literacy-fundamentals
7. Microsoft Digital Literacy
   - https://www.microsoft.com/en-us/digitalliteracy/overview.aspx
8. 12 Essentials of Digital Literacy
   - .http://info.learning.com/hubfs/Corp_Site/Sales%20Tools/12EssentialSkills_Brochure_Apr16.pdf
9. US Digital Literacy
   - http://www.digitalliteracy.us
10. What are literacy skills?
    - https://k12.thoughtfullearning.com/FAQ/what-are-literacy-skills

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4.2: Literacy in the Digital Age- From traditional to Digital to Mobile Digital Literacies

Introduction

Literacy is an enigma. While it is easy to agree that everyone should be literate, the conversation around what being literate looks like, and what the term itself is even means depends much on who is leading the conversation and who has a stake in the conversation. The term itself has historically been defined as “possession of the complementary mental technologies of reading and writing, literacy is not only difficult to define in individuals and delimit within societies, but it is also charged with emotional and political meaning” (pg. 12). This perceived simplicity has at times led to many including news reporters and various academic scholars to refer “to whole societies as “illiterate and uncivilized” as a single referent, and “illiterate” is still a term which carries a negative connotation” (Wagner (1991, pg. 12). Of course, such characterization, although still rampant, they are at least being questioned. At last literacy is being considered much more widely, and being recognised as integral to a culture where it is embedded with functions and meanings.

Literacy can be challenging to define. When narrowly defined crucial elements are left off and when stated too broadly it can be a catch-all term. This chapter does not purport to present a definition of literacy, for such a task has been undertaken and explained by many (Buckingham 1993; Knobel & Healy, 1998; Burniske, 2000 Cope and Kalantzis, 2000; & Semali 2002) who are much better versed in the subject. The goal in this chapter is to look at the understanding of digital literacy and whether or not it is (it broad enough to include the features of) inclusive enough to account for the affordance of mobile devices. Affordance in this context, can mean providing an opportunity that allows an individual to learn or perform a specific action or ability by using a mobile device. Features like portability and individuality are playing a significant role in enhancing mobile digital literacies. These features give any individual the flexibility to learn whenever they want and wherever they want (Sunga et. al, 2015). Inclusiveness is used as a reference to considering a wide range of diverse human factors, i.e., every user is entitled to participation, content creation, and giving a response, which extends beyond reading, writing or any barrier (Kirisci et. al, 2012).

Evolution of Literacy

The term literacy itself has undergone numerous evolutions. Figure 1 below illustrates the different components that made up the United Nations Educational, Scientific and Cultural Organization (UNESCO), definitions from 1958 – 2005.

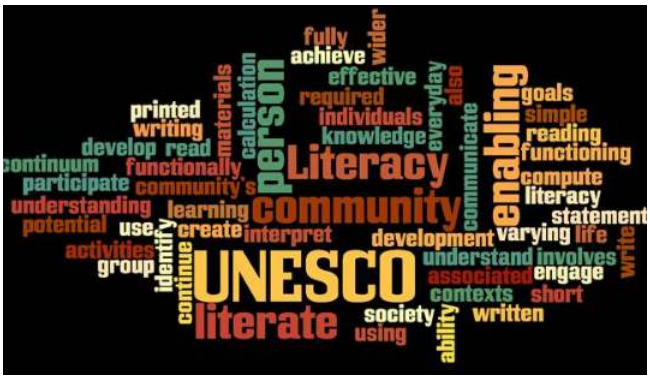


Figure 1: UNESCO literacy keyword

UNESCO works continuously to promote inclusive education practices that eliminate the obstacles limiting the participation and success of all learners, respect the needs of people from different backgrounds and help to eliminate all kinds of discrimination in the learning environment. To illustrate the transformation of literacy Ahmed (2011), collected definitions that depict how UNESCO has changed their understanding over time. As cited by Ahmed (2011), over the decades, UNESCO has provided the following definition at different times between 1958 and 2005:

1. A person is literate who can, with understanding, both read and write a short simple statement on his or her everyday life (UNESCO 1958);
2. A person is functionally literate who can engage in all those activities in which literacy is required for effective functioning of his or her group and community and also for enabling him or her to continue to use reading, writing and calculation for his or her own and the community’s development (UNESCO 1978);
3. Literacy is the ability to identify, understand, interpret, create, communicate and compute using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve his or her goals,

develop his or her knowledge and potential, and participate fully in community and wider society (UNESCO 2005). (pg. 181)

The countries that have membership in UNESCO have also adopted similar stances on defining literacy and as such have had to adjust their definitions accordingly. The table below presents a random sample of countries and their definition of literacy. UNESCO has the information below available on their website from 1975 to 2010. The data was combined in an excel file and each item given a random ID which was used to create the table below. As evident, the definition of literacy has changed over time, and in alignment with the definitions provided by UNESCO.

Table 1: National literacy definitions by year

Country	Year	Literacy Definition
Rwanda	1978	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life
Argentina	1980	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life
India	1981	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life
Lithuania	1989	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life
Ukraine	2001	A person who has any level of education or can read (for 6 year old people and older)
Liberia	2004	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life.
South Africa	2007	Household member can read and write in at least one language. If a person can only read or only write, that person is considered illiterate.
Benin	2009	A person is literate who can, with understanding, both read and write a short simple statement on his or her everyday life
Chile	2009	Able to read and write. The population with 2 or more years of schooling is considered.
Uganda	2010	Able to read and write with understanding in any language
Source: UNESCO (http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/GMR/pdf/gmr2009/EFA_Literacy_metadata_2009.pdf		

The three definitions from UNESCO and the definitions by the countries above, show that literacy has undergone various transformations. They've ranged primarily from the reading and writing paradigm to now the inclusion of electronic media and

communication. Smyth (2011) opined that literacy has evolved, it has gone beyond the mastery of the ability to read and write a language but now the comprehension and how to use technology as a medium and not the mastery of technical language.

The move to include technology into the definition of literacy is undoubtedly due to the integration of Information Communication Technologies (ICTs) into everyday life. This integration and usage has brought about the information age, which is characterized by "the widespread proliferation of emerging information and communication technologies and the capabilities that those technologies provide and will provide humankind to overcome the barriers imposed on communications by time, distance, and location and the limits and constraints inherent in human capacities to process information and make decisions. Advocates of the concept of the Information Age maintain that we have embarked on a journey in which information and communications will become the dominant forces in defining and shaping human actions, interactions, activities, and institutions" (Alberts 7 Papp, 1997, pg. 2).

The information age has brought with it a new literacy referred to as digital literacy. In staying loyal to the trunk from which it sprouts, the term digital literacy has proven to be as elusive in its definition. Most definitions closely resemble that put forth by the United States, Federal Communications Commission (FCC) which argues that ". . . digital literacy generally refers to a variety of skills associated with using ICT (information and communication technologies) to find, evaluate, create and communicate information. It is the sum of the technical skills and cognitive skills people employ to use computers to retrieve information, interpret what they find and judge the quality of that information. It also includes the ability to communicate and collaborate using the Internet—through blogs, self-published documents and presentations and collaborative social networking platforms" (as cited by Clark & Visser, 2011, pg. 38).

This definition although seemingly a catchall and somewhat nebulous, still does not mention or reference the growth of mobile devices and the role that they are playing in society. Mobile devices evolved from what only the learned operated to a user-friendly device; it is not surprising that its price is beginning to decrease in emerging markets, pr items from being expensive luxuries (GMCA, 2017). The definition seems to also ignore the role mobile devices have in globalization which is not to be underestimated especially since such devices have grown beyond simple miniature computers that enable the transmission of the human voice to being content creation, delivery and consumption systems (Collins, 2005).

The definition of mobile digital literacy has grown over time due to technological advancement. An individual has become more reliant on mobile phones as compared to someone who was using it ten years back. In 1973, when a mobile phone was introduced, it was solely used for communication, mobile literacy meant being able to use the feature limited to the capability of dialing phone numbers to call someone. Today, that definition of mobile literacy can be seen in a new light with the incessant upgrades in the features. It can now be defined as the capability of using and exercising the wide array of features and applications in a personalized manner.

The growth of mobile devices to seemingly ubiquitous levels is affecting communities around the world, altering the ways we communicate, educate, collaborate and engage with one another; altering what we know or think we know about our identity and the very sense we have of space and time (Traxler, 2008). This development which in many ways is akin to Khuns's (1962) paradigm shift theory of science necessitates an evaluation of the current models of literacies and more specifically digital literacies in which mobile devices seem to belong. As Clancy & Lowrie (2002), argued for new approaches and models to understand literacies brought about by the digital age, I am similarly arguing that the digital age has evolved beyond what it was at the turn of the century or even five years ago and as such the understanding of digital literacies need to be updated to address the new mobile digital era.

Why the Update

There is an interaction between mobile devices & traditional understanding of literacy. Whereas traditional literacy was more concerned with reading and writing, mobile devices afford even those without the ability to read or write a chance to participate in the conversation. Some do this by the voice features of the technology others can do so by memorizing various patterns of the device they own, which thereby allow them to conduct business and communicate with others even though they cannot tell a difference between a 6 and a 9, yet they are able to dial it without a problem.

Mobile devices are changing how people are learning. According to Telecomlead, an online B2B publication dedicated to the telecom industry, as of Feb 2019, 89 percent of India's population are active mobile users. However, the literacy rate of India is often cited to be at 71.20%. Even though more than 89 percent of the Indian population has a mobile phone, it does not mean that the percentage of mobile literate in India is limited to 89 percent who own a smartphone. In fact, the number of mobile literacy rates can be higher than the number of people who actually own a device. To elaborate further, let's look at an experiment "Hole-in-the-wall" conducted by Dr. Sugata Mitra in 1999 in India to check the effectiveness of digital literacy. Dr. Mitra's team carved a

“hole in the wall to append the slum in Kalkaji, New Delhi to the NIIT premises. A free accessible computer was set up as a learning station for the people living in the slums, especially the children. The children, who now had access to the device, self-taught themselves the skill to operate the computer without prior knowledge or experience. This experiment establishes the point that one does not have to have only the ability to read or write to be considered literate. Nor does one need to go to a formal educational institution to be digitally literate, but to be able to read and write one often needs to go through some sort of formal schooling. Viewed in the context of this paper, similarly, one does not need to only be able to read or write to be considered mobile digital literate. In fact, a person without the ability to read or write can still use a mobile device to accomplish their tasks. a mobile device in order to qualify for Mobile Digital Literacy.

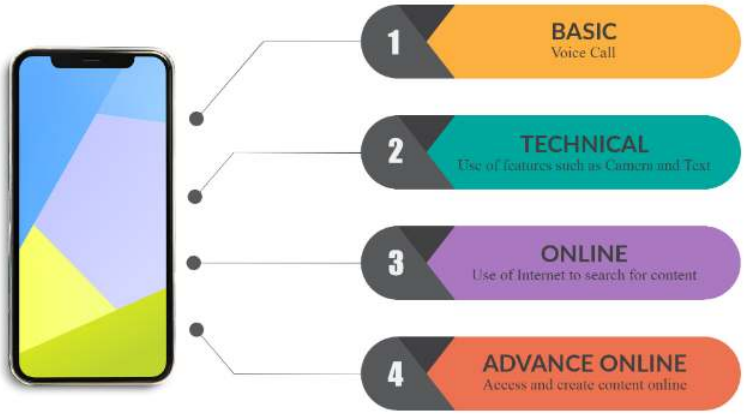


Figure 1. Stages of mobile digital literacies

Mobile Digital Literacies has four stages. These stages help to determine how literate an individual is in terms of using a mobile phone.

Basic: The basic digital mobile literacies mean a person can use their voice to communicate using mobile devices. For example, if a person is able to make a phone call to another they can be considered to have basic digital mobile literacy skills. One does not need to know how to read and write in this context, because since many mobile phones have the ability to store favourite numbers or speed dial, an individual can simply press one number and be able to communicate.

Technical: Mobile devices come with many features such as cameras and the ability to send multimedia messages. The ability to use mobile features such as sending the text, camera, calendar and calculator go beyond one’s ability to simply read and write. Such skills classify the user as a technical mobile digital literate.

Online Digital Literacy: Most mobile devices have the ability to connect to the internet. This connectivity aspect is what makes the devices so appealing to many. However, the presence of connectivity does not necessarily mean someone knows how to use the devices to complete tasks online. Hence, mobile online digital literates are those who can easily browse and search for content using different mobile applications and internet browsers.

Advance Online Literate: Lastly, advanced mobile online literates are capable enough to access, create, navigate and understand online content on a range of digital devices (GSMA, 2015). They not only have the abilities referenced in the previous stages but can also make use of the information for advance decision making.

Mobile Digital Literacies

We propose moving to adopt a new term, Mobile Digital Literacies (MDLS), which is concerned with the role mobile devices play in the world of digital literacy. Mobile Digital Literacies (MDLS) can be defined as an individual’s ability to identify, understand, interpret, create and communicate using the features and functionality of a mobile phone. It also serves an opportunity to create an identity and bring more people into the dialogue by allowing those often left out of the conversation a chance to create, recreate and reclaim their identities.

This re-imagining of digital literacy is more important because definitions, teachings and understandings of digital literacy have framed the conversation primarily “as the investigation of ways of dealing with the computer and the Internet” (Pietrass, 2007, pg. 8), which does not include new technologies.

This positioning of digital literacy or new literacies as something that someone else does that students have to examine critically does not go far enough to capture the effects of mobile devices on society and limits our ability, therefore, fall short at providing a framework to critically look at the phenomenon. The issue is no longer simply about the effect of available information but rather the effect of the information one creates.

Many people, especially those born in the 1990s to today have most of their life digitally recorded. They saw the evolution of many digital platforms firsthand, which includes mobile devices as well. They can easily adapt to the options and in turn, help the new age population to adapt to the options as well. In *Born Digital*, Palfrey & Gasser *(2008)* discuss ways to understand those born in the digital age and also cover the term *Digital Dossier* which they attribute to Daniel J. Solove, a professor of law at the George Washington University Law School (p. 301). The definition of digital dossiers is that, today even before a person is born today, their digital identity starts being constructed through things such as prenatal exams that a mother goes to, and ultrasound images from doctor visits. Even before a child is outside its mother's womb, his or her picture has possibly already been on the Internet if the parents decided to share the picture of the ultrasound. This life cycle continues with doctor visits for various check-ups when a child is born, to tweets, blogs, websites and social networking sites that a person might engage in. Overtime the digital dossier accumulates a lot of material so that it is possible when a person born in 2000 reaches 30yrs of age there is no longer a need to go visit the parents to look at baby pictures, rather all that information would be available and accessible through some form of network, because it has been archived since before the person was born.

An examination of one's digital dossier is not mentioned or alluded to in the current definition of digital literacy or the discussions of new literacies. Consequently, students in schools are taught how to critically examine what others produce and to question the validity of different perspectives presented in digital forms (a case can be made that even this is not being done well), however what is missing is a lesson on self-examination.

In 2011, world governments and leaders were overthrown because of injustices that they committed against their own people, which are brought to light by the use of mobile devices. The power of mobile devices has extended the nature by which humans are connected, a critical examination of the role the individual plays not only in critically examining what they've read or seen, but rather what they've created and posted is a necessary aspect of a new digital literacy or a creation of a new literacy all together.

Another motivation for the evaluation of the current understanding of digital literacy is the nature by which mobile devices have allowed those traditionally viewed as disenfranchised and marginalized to enter the conversation.

The argument against the investment in ICTs especially in Afrikan schools has often revolved around whether such an investment is worthy of consideration more so than other pressing needs such as addressing, HIV/AIDS, malnutrition, malaria, etc. (Slay & Dalvit, 2008). This 'can't chew and work/walk at the same time' or 'the one thing at a time approach' is no longer the only option. Mobile devices have taken away the absence of communities in the "developing world" from the global conversation while they address "more pressing issues". Mobile devices and the effect they've had have also allowed for different communities to be looked at from their perspectives because of what they contribute to the overall network. This has moved the conversation from the generic global village to recognising that even as technology there are still differences amongst cultures. This realisation has prompted Mills (2010) therefore conclude that "while giving acknowledgment to the significant advances in digital communication technologies, there is not a single global village—rather, there are groups with varied levels of participation in digital practices across local villages around the world" (p. 262).

As argued by Millis (2010), in her survey of the literature, new literacies have often been concerned with the digital divide and leave the impression that technology is leaving those in marginalised and low income communities at a disadvantage. Although there are constraints, those in marginalised communities are finding a way to enter into the dialogue and are not simply shut out.

Put simply, the conversation should no longer be solely about how the marginalized are left out of the conversation but rather how they are altering the conversation because they are taking part. Whether the various gatekeepers and those in privilege positions are recognising it, the fact remains that those that did not participate before are not only part of the conversation, but they are beginning their own conversations that have nothing to do with what has been designated as the topic du jour. Like water they are seeping through at all different crevices albeit slowly.

Conclusion

In this paper, we have argued that the current framing of digital literacy does not go enough to include the changes and affordance that are brought on by mobile devices. We are proposing for an expanded definition of digital literacy which takes into account the different "practices across multiple technologies, media, modes, text formats, and social contexts" (Mills, 2010, p 262).

In agreement with Kress (2010), we believe that the new definition of digital literacies (even if it does not result in the name we propose of Mobile Digital Literacy – MDL), it must have the following three components:

1. the rapid evolution of digital technologies;
2. a new more pervasive emphasis on multimodality in digital communications;
3. a new approach to communication and interaction that is best characterised by an emphasis on design rather than a highly separable distinction between 'writing' and 'reading' (p5).

The choice is to either make room at the table by broadening the definition of digital literacy or to create a new table introducing a new category that includes mobile devices. The traditional way of defining literacy & digital literacies is coming up short – we need to include the different things that mobile devices contribute, and as such we must continue to reconfigure what we traditionally know as literacy.

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4.3: The Digital Divide and the lack Financial Literacy among First Generation

Imagine walking into a bank and seeing no bank tellers around to take deposit money. A few years ago, that is what happened to me. I walked into a private bank to deposit money into my mom's account with no bank tellers' insight. I later realized that the bank had done away with the bank tellers, including the drive-through teller, and instead moved basic financial transactions online. Imagine a young person with no knowledge of online banking and no understanding of financial literacy terminology to figure out online banking on their own. Now throw in that the young person may also have no access to a computer and uses an old cell phone where it only works with public WiFi.

As a former assistant branch manager for a private bank and Certified Financial Education Instructor with the National Financial Educators Council, I know the frustration that people go through when they don't understand how online banking works and the frustration of basic financial literacy terminology. The future of banking going digital has me more worried about first-generation college students, especially among minority groups, because I fall into the two groups. Studies show how the digital divide and lack of financial literacy education among first-generation college students can be set back compared to non-first generation peers.

As a first-generation college student myself, I had to learn financial literacy on my own through life experiences, and I did not have the latest computer technology growing up until I was in high school. A first-generation college student is defined as an individual whose family comes from a low or medium-income background or high school education without attending college (College Board, 2016). When it comes to financial literacy, studies consistently show that a large number of people lack the financial literacy skills necessary to make critical financial decisions such as taking out a mortgage or understanding the stock market (Mandell & Klein, 2009). First-generation college students are vulnerable to falling into debt, ruining their credit score, or lacking the knowledge of building a budget (Lusardi, Mitchell & Curto 2010). A recent study by the TIAA-CREF Institute stated that 12% of college-educated Hispanics demonstrated advanced financial knowledge, and only 32% displayed basic financial literacy (De Bassa, Lusardi, & Yakoboski, 2015). This kind of experience makes it difficult for Hispanics to be financial stable, comprehend financial literature, and build wealth for the future. I don't see any easy solution to solving financial literacy and the digital divide at the same time.

The solution I have for financial literacy is that every university across the United States requires its students to complete a three-credit financial literacy course. Financial literacy education can play a pivotal role in students' lives. Ineffective money management can result in individuals making poor financial decisions that may prevent them from reaching full financial relief and possibly living paycheck to paycheck. I have yet to figure out how to solve the digital divide among first-generation college students because of their complexity. For example, the digital divide includes unreliable internet access, older devices that don't work, inadequate cell phone data places, and computers.

To reach a larger audience for financial literacy education the best way are free tools such as YouTube and social media like Instagram. I can teach an individual the basic concepts of online banking and the terminology associated by publishing online courses on YouTube, which I have done. The tools that I use to create financial literacy education in the digital age is Camtasia to record the video and publish on YouTube and Vimeo for easy access to anyone that is interested. Another digital tool I use to teach financial literacy education is Instagram. I published short videos on Instagram TV for individuals to learn about saving money, creating a financial budget, and developing financial goals.

No matter how many courses I publish on YouTube the individual still needs to access the internet. I can't teach a person how to obtain a computer or a smartphone capable of opening up a bank account. How do you solve the digital divide and lack of financial literacy among first-generation college students?

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4.4: Literacy in the Digital Age- From traditional to Digital to Mobile Digital Literacies

Introduction

Literacy is an enigma. While it is easy to agree that everyone should be literate, the conversation around what being literate looks like, and what the term itself is even means depends much on who is leading the conversation and who has a stake in the conversation. The term itself has historically been defined as “possession of the complementary mental technologies of reading and writing, literacy is not only difficult to define in individuals and delimit within societies, but it is also charged with emotional and political meaning” (pg. 12). This perceived simplicity has at times led to many including news reporters and various academic scholars to refer “to whole societies as “illiterate and uncivilized” as a single referent, and “illiterate” is still a term which carries a negative connotation” (Wagner (1991, pg. 12). Of course, such characterization, although still rampant, they are at least being questioned. At last literacy is being considered much more widely, and being recognised as integral to a culture where it is embedded with functions and meanings.

Literacy can be challenging to define. When narrowly defined crucial elements are left off and when stated too broadly it can be a catch-all term. This chapter does not purport to present a definition of literacy, for such a task has been undertaken and explained by many (Buckingham 1993; Knobel & Healy, 1998; Burniske, 2000 Cope and Kalantzis, 2000; & Semali 2002) who are much better versed in the subject. The goal in this chapter is to look at the understanding of digital literacy and whether or not it is (it broad enough to include the features of) inclusive enough to account for the affordance of mobile devices. Affordance in this context, can mean providing an opportunity that allows an individual to learn or perform a specific action or ability by using a mobile device. Features like portability and individuality are playing a significant role in enhancing mobile digital literacies. These features give any individual the flexibility to learn whenever they want and wherever they want (Sunga et. al, 2015). Inclusiveness is used as a reference to considering a wide range of diverse human factors, i.e., every user is entitled to participation, content creation, and giving a response, which extends beyond reading, writing or any barrier (Kirisci et. al, 2012).

Evolution of Literacy

The term literacy itself has undergone numerous evolutions. Figure 1 below illustrates the different components that made up the United Nations Educational, Scientific and Cultural Organization (UNESCO), definitions from 1958 – 2005.

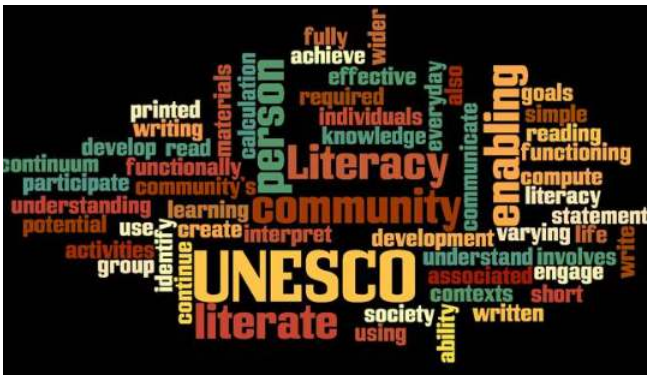


Figure 1: UNESCO literacy keyword

UNESCO works continuously to promote inclusive education practices that eliminate the obstacles limiting the participation and success of all learners, respect the needs of people from different backgrounds and help to eliminate all kinds of discrimination in the learning environment. To illustrate the transformation of literacy Ahmed (2011), collected definitions that depict how UNESCO has changed their understanding over time. As cited by Ahmed (2011), over the decades, UNESCO has provided the following definition at different times between 1958 and 2005:

1. A person is literate who can, with understanding, both read and write a short simple statement on his or her everyday life (UNESCO 1958);
2. A person is functionally literate who can engage in all those activities in which literacy is required for effective functioning of his or her group and community and also for enabling him or her to continue to use reading, writing and calculation for his or her own and the community’s development (UNESCO 1978);
3. Literacy is the ability to identify, understand, interpret, create, communicate and compute using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve his or her goals,

develop his or her knowledge and potential, and participate fully in community and wider society (UNESCO 2005). (pg. 181)

The countries that have membership in UNESCO have also adopted similar stances on defining literacy and as such have had to adjust their definitions accordingly. The table below presents a random sample of countries and their definition of literacy. UNESCO has the information below available on their website from 1975 to 2010. The data was combined in an excel file and each item given a random ID which was used to create the table below. As evident, the definition of literacy has changed over time, and in alignment with the definitions provided by UNESCO.

Table 1: National literacy definitions by year

Country	Year	Literacy Definition
Rwanda	1978	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life
Argentina	1980	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life
India	1981	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life
Lithuania	1989	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life
Ukraine	2001	A person who has any level of education or can read (for 6 year old people and older)
Liberia	2004	A person is defined as literate if he or she can, with understanding, both read and write a short, simple statement on his or her everyday life.
South Africa	2007	Household member can read and write in at least one language. If a person can only read or only write, that person is considered illiterate.
Benin	2009	A person is literate who can, with understanding, both read and write a short simple statement on his or her everyday life
Chile	2009	Able to read and write. The population with 2 or more years of schooling is considered.
Uganda	2010	Able to read and write with understanding in any language
Source: UNESCO (http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/GMR/pdf/gmr2009/EFA_Literacy_metadata_2009.pdf		

The three definitions from UNESCO and the definitions by the countries above, show that literacy has undergone various transformations. They've ranged primarily from the reading and writing paradigm to now the inclusion of electronic media and

communication. Smyth (2011) opined that literacy has evolved, it has gone beyond the mastery of the ability to read and write a language but now the comprehension and how to use technology as a medium and not the mastery of technical language.

The move to include technology into the definition of literacy is undoubtedly due to the integration of Information Communication Technologies (ICTs) into everyday life. This integration and usage has brought about the information age, which is characterized by "the widespread proliferation of emerging information and communication technologies and the capabilities that those technologies provide and will provide humankind to overcome the barriers imposed on communications by time, distance, and location and the limits and constraints inherent in human capacities to process information and make decisions. Advocates of the concept of the Information Age maintain that we have embarked on a journey in which information and communications will become the dominant forces in defining and shaping human actions, interactions, activities, and institutions" (Alberts 7 Papp, 1997, pg. 2).

The information age has brought with it a new literacy referred to as digital literacy. In staying loyal to the trunk from which it sprouts, the term digital literacy has proven to be as elusive in its definition. Most definitions closely resemble that put forth by the United States, Federal Communications Commission (FCC) which argues that ". . . digital literacy generally refers to a variety of skills associated with using ICT (information and communication technologies) to find, evaluate, create and communicate information. It is the sum of the technical skills and cognitive skills people employ to use computers to retrieve information, interpret what they find and judge the quality of that information. It also includes the ability to communicate and collaborate using the Internet—through blogs, self-published documents and presentations and collaborative social networking platforms" (as cited by Clark & Visser, 2011, pg. 38).

This definition although seemingly a catchall and somewhat nebulous, still does not mention or reference the growth of mobile devices and the role that they are playing in society. Mobile devices evolved from what only the learned operated to a user-friendly device; it is not surprising that its price is beginning to decrease in emerging markets, pr items from being expensive luxuries (GMCA, 2017). The definition seems to also ignore the role mobile devices have in globalization which is not to be underestimated especially since such devices have grown beyond simple miniature computers that enable the transmission of the human voice to being content creation, delivery and consumption systems (Collins, 2005).

The definition of mobile digital literacy has grown over time due to technological advancement. An individual has become more reliant on mobile phones as compared to someone who was using it ten years back. In 1973, when a mobile phone was introduced, it was solely used for communication, mobile literacy meant being able to use the feature limited to the capability of dialing phone numbers to call someone. Today, that definition of mobile literacy can be seen in a new light with the incessant upgrades in the features. It can now be defined as the capability of using and exercising the wide array of features and applications in a personalized manner.

The growth of mobile devices to seemingly ubiquitous levels is affecting communities around the world, altering the ways we communicate, educate, collaborate and engage with one another; altering what we know or think we know about our identity and the very sense we have of space and time (Traxler, 2008). This development which in many ways is akin to Khuns's (1962) paradigm shift theory of science necessitates an evaluation of the current models of literacies and more specifically digital literacies in which mobile devices seem to belong. As Clancy & Lowrie (2002), argued for new approaches and models to understand literacies brought about by the digital age, I am similarly arguing that the digital age has evolved beyond what it was at the turn of the century or even five years ago and as such the understanding of digital literacies need to be updated to address the new mobile digital era.

Why the Update

There is an interaction between mobile devices & traditional understanding of literacy. Whereas traditional literacy was more concerned with reading and writing, mobile devices afford even those without the ability to read or write a chance to participate in the conversation. Some do this by the voice features of the technology others can do so by memorizing various patterns of the device they own, which thereby allow them to conduct business and communicate with others even though they cannot tell a difference between a 6 and a 9, yet they are able to dial it without a problem.

Mobile devices are changing how people are learning. According to Telecomlead, an online B2B publication dedicated to the telecom industry, as of Feb 2019, 89 percent of India's population are active mobile users. However, the literacy rate of India is often cited to be at 71.20%. Even though more than 89 percent of the Indian population has a mobile phone, it does not mean that the percentage of mobile literate in India is limited to 89 percent who own a smartphone. In fact, the number of mobile literacy rates can be higher than the number of people who actually own a device. To elaborate further, let's look at an experiment "Hole-in-the-wall" conducted by Dr. Sugata Mitra in 1999 in India to check the effectiveness of digital literacy. Dr. Mitra's team carved a

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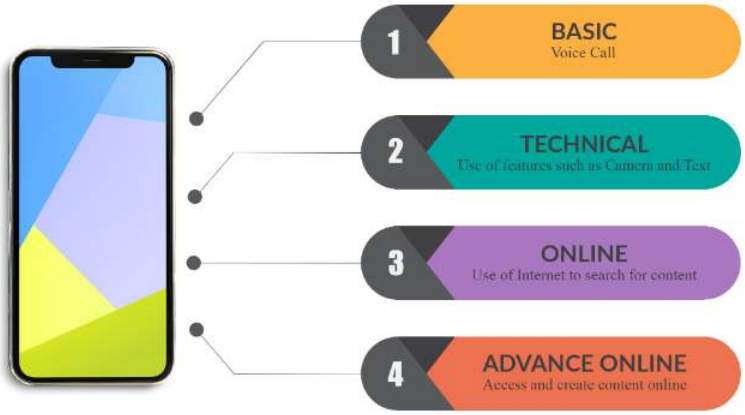


Figure 1. Stages of mobile digital literacies

Mobile Digital Literacies has four stages. These stages help to determine how literate an individual is in terms of using a mobile phone.

Basic: The basic digital mobile literacies mean a person can use their voice to communicate using mobile devices. For example, if a person is able to make a phone call to another they can be considered to have basic digital mobile literacy skills. One does not need to know how to read and write in this context, because since many mobile phones have the ability to store favourite numbers or speed dial, an individual can simply press one number and be able to communicate.

Technical: Mobile devices come with many features such as cameras and the ability to send multimedia messages. The ability to use mobile features such as sending the text, camera, calendar and calculator go beyond one's ability to simply read and write. Such skills classify the user as a technical mobile digital literate.

Online Digital Literacy: Most mobile devices have the ability to connect to the internet. This connectivity aspect is what makes the devices so appealing to many. However, the presence of connectivity does not necessarily mean someone knows how to use the devices to complete tasks online. Hence, mobile online digital literates are those who can easily browse and search for content using different mobile applications and internet browsers.

Advance Online Literate: Lastly, advanced mobile online literates are capable enough to access, create, navigate and understand online content on a range of digital devices (GSMA, 2015). They not only have the abilities referenced in the previous stages but can also make use of the information for advance decision making.

Mobile Digital Literacies

We propose moving to adopt a new term, Mobile Digital Literacies (MDLS), which is concerned with the role mobile devices play in the world of digital literacy. Mobile Digital Literacies (MDLS) can be defined as an individual's ability to identify, understand, interpret, create and communicate using the features and functionality of a mobile phone. It also serves an opportunity to create an identity and bring more people into the dialogue by allowing those often left out of the conversation a chance to create, recreate and reclaim their identities.

This re-imagining of digital literacy is more important because definitions, teachings and understandings of digital literacy have framed the conversation primarily "as the investigation of ways of dealing with the computer and the Internet" (Pietrass, 2007, pg. 8), which does not include new technologies.

This positioning of digital literacy or new literacies as something that someone else does that students have to examine critically does not go far enough to capture the effects of mobile devices on society and limits our ability, therefore, fall short at providing a framework to critically look at the phenomenon. The issue is no longer simply about the effect of available information but rather the effect of the information one creates.

Many people, especially those born in the 1990s to today have most of their life digitally recorded. They saw the evolution of many digital platforms firsthand, which includes mobile devices as well. They can easily adapt to the options and in turn, help the new age population to adapt to the options as well. In *Born Digital*, Palfrey & Gasser *(2008)* discuss ways to understand those born in the digital age and also cover the term *Digital Dossier* which they attribute to Daniel J. Solove, a professor of law at the George Washington University Law School (p. 301). The definition of digital dossiers is that, today even before a person is born today, their digital identity starts being constructed through things such as prenatal exams that a mother goes to, and ultrasound images from doctor visits. Even before a child is outside its mother's womb, his or her picture has possibly already been on the Internet if the parents decided to share the picture of the ultrasound. This life cycle continues with doctor visits for various check-ups when a child is born, to tweets, blogs, websites and social networking sites that a person might engage in. Overtime the digital dossier accumulates a lot of material so that it is possible when a person born in 2000 reaches 30yrs of age there is no longer a need to go visit the parents to look at baby pictures, rather all that information would be available and accessible through some form of network, because it has been archived since before the person was born.

An examination of one's digital dossier is not mentioned or alluded to in the current definition of digital literacy or the discussions of new literacies. Consequently, students in schools are taught how to critically examine what others produce and to question the validity of different perspectives presented in digital forms (a case can be made that even this is not being done well), however what is missing is a lesson on self-examination.

In 2011, world governments and leaders were overthrown because of injustices that they committed against their own people, which are brought to light by the use of mobile devices. The power of mobile devices has extended the nature by which humans are connected, a critical examination of the role the individual plays not only in critically examining what they've read or seen, but rather what they've created and posted is a necessary aspect of a new digital literacy or a creation of a new literacy all together.

Another motivation for the evaluation of the current understanding of digital literacy is the nature by which mobile devices have allowed those traditionally viewed as disenfranchised and marginalized to enter the conversation.

The argument against the investment in ICTs especially in Afrikan schools has often revolved around whether such an investment is worthy of consideration more so than other pressing needs such as addressing, HIV/AIDS, malnutrition, malaria, etc. (Slay & Dalvit, 2008). This 'can't chew and work/walk at the same time' or 'the one thing at a time approach' is no longer the only option. Mobile devices have taken away the absence of communities in the "developing world" from the global conversation while they address "more pressing issues". Mobile devices and the effect they've had have also allowed for different communities to be looked at from their perspectives because of what they contribute to the overall network. This has moved the conversation from the generic global village to recognising that even as technology there are still differences amongst cultures. This realisation has prompted Mills (2010) therefore conclude that "while giving acknowledgment to the significant advances in digital communication technologies, there is not a single global village—rather, there are groups with varied levels of participation in digital practices across local villages around the world" (p. 262).

As argued by Millis (2010), in her survey of the literature, new literacies have often been concerned with the digital divide and leave the impression that technology is leaving those in marginalised and low income communities at a disadvantage. Although there are constraints, those in marginalised communities are finding a way to enter into the dialogue and are not simply shut out.

Put simply, the conversation should no longer be solely about how the marginalized are left out of the conversation but rather how they are altering the conversation because they are taking part. Whether the various gatekeepers and those in privilege positions are recognising it, the fact remains that those that did not participate before are not only part of the conversation, but they are beginning their own conversations that have nothing to do with what has been designated as the topic du jour. Like water they are seeping through at all different crevices albeit slowly.

Conclusion

In this paper, we have argued that the current framing of digital literacy does not go enough to include the changes and affordance that are brought on by mobile devices. We are proposing for an expanded definition of digital literacy which takes into account the different "practices across multiple technologies, media, modes, text formats, and social contexts" (Mills, 2010, p 262).

In agreement with Kress (2010), we believe that the new definition of digital literacies (even if it does not result in the name we propose of Mobile Digital Literacy – MDL), it must have the following three components:

1. the rapid evolution of digital technologies;
2. a new more pervasive emphasis on multimodality in digital communications;
3. a new approach to communication and interaction that is best characterised by an emphasis on design rather than a highly separable distinction between 'writing' and 'reading' (p5).

The choice is to either make room at the table by broadening the definition of digital literacy or to create a new table introducing a new category that includes mobile devices. The traditional way of defining literacy & digital literacies is coming up short – we need to include the different things that mobile devices contribute, and as such we must continue to reconfigure what we traditionally know as literacy.

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4.5: Digital literacies and the skills of the digital age

Abstract – *This chapter is intended to provide a framework and understanding of digital literacy, what it is and why it is important. The following pages explore the roots of digital literacy, its relationship to language literacy and its role in 21st century life.*

Introduction

Unlike previous generations, learning in the digital age is marked by the use of rapidly evolving technology, a deluge of information and a highly networked global community (Dede, 2010). In such a dynamic environment, learners need skills beyond the basic cognitive ability to consume and process language. In other words: To understand what the characteristics of the digital age, and of digital learners, means for how people learn in this new and changing landscape, one may turn to the evolving discussion of literacy or, as one might say now, of digital literacy. The history of literacy contextualizes digital literacy and illustrates changes in literacy over time. By looking at literacy as a historical phenomenon, the characteristics of which have evolved over time, we can glean the fundamental characteristics of the digital age. Those characteristics in turn illuminate the skills needed in order to take advantage of digital environments. The following discussion is an overview of digital literacy, its essential components and why it is important for learning in a digital age.

Moving from Literacy to Digital Literacy

Literacy refers to the ability of people to read and write (UNESCO, 2017). Reading and writing then, is about encoding and decoding information between written symbols and sound (Resnick, 1983; Tyner, 1998). More specifically, literacy is the ability to understand the relationship between sounds and written words such that one may read, say and understand them (UNESCO, 2004; Vlieghe, 2015). Literacy is often considered a skill or competency and is often referred to as such. Children and adults alike can spend years developing the appropriate skills for encoding and decoding information.

Over the course of thousands of years, literacy has become much more common and widespread with a global literacy rate ranging from 81% to 90% depending on age and gender (UNESCO, 2016). From a time when literacy was the domain of an elite few, it has grown to include huge swaths of the global population. There are a number of reasons for this, not the least of which are some of the advantages the written word can provide. Kaestle, (1985) tells us that “literacy makes it possible to preserve information as a snapshot in time, allows for recording, tracking and remembering information, and sharing information more easily across distances among others” (p. 16). In short, literacy led “to the replacement of myth by history and the replacement of magic by skepticism and science. Writing allowed bureaucracy, accounting, and legal systems with universal rules and has replaced face-to-face governance with depersonalized administration” (Kaestle, 1985, p. 16). This is not to place a value judgement on the characteristics of literacy but rather to explain some of the many reasons why it spread.

There are, however, other reasons for the spread of literacy. In England, throughout the middle ages literacy grew in part, because people who acquired literacy skills were able to parlay those skills into work with more pay and social advantages (Clanchy, 1983). The great revolutions of the 19th and 20th centuries also relied on leaders who could write and compatriots who could read as a way to spread new ideas beyond the street corners and public gatherings of Paris, Berlin, and Vienna. Literacy was perceived as necessary for spreading information to large numbers of people. In the 1970’s Paulo Freire insisted that literacy was vital for people to participate in their own governance and civic life (Tyner, 1998). His classic “Pedagogy of the Oppressed” begins from the premise that bringing the traditional illiterate and uneducated into learning situations as partners with their teachers awakens the critical conscience necessary as a foundation for action to foment change (Freire, 1973). UNESCO (2004) also acknowledges the role that literacy plays in enabling populations to effect change and achieve social justice aims. They speak even more broadly, moving beyond the conditions necessary for revolution, contending that literacy is a fundamental right of every human being, providing employment opportunities, and the fundamental skills necessary to accrue greater wealth and improve one’s quality of life.

Although the benefits of literacy were a driving force in its spread, technological advances also enabled the spread of literacy to greater and greater numbers of people. From stamped tokens, tally sticks and clay tablets, to ancient scrolls, handwritten volumes, the printing press, typewriters, and finally computers, technology is largely responsible for driving the evolution of literacy into the particular forms of encoding and decoding information associated with the digital age. Technology has made it possible for literacy to move from the hands of the few to the hands of the masses and to morph into a digital environment with characteristics extending far beyond anything that has been seen before.

Not only did computers and electronic technology deliver literacy into the hands of many but also created an environment that made it possible to store vast amounts of information. Books and libraries led the way to making information easily available to the public, but within the age of computers and the internet the volume of accessible information is larger than ever, more readily available than ever, and changing more quickly than ever before. In the early 21st century, technology continues to develop more quickly than at any time in the past creating an environment that is constantly changing. These changes contribute to the need for different skills beyond traditional literacy skills also called *new media literacy* (Jenkins, 2018). For a short video on the reasons why digital literacy is important visit "The New Media Literacies" located on YouTube.com and created by the research team at Project New Media Literacies.

Literacy in the Digital Age

If literacy involves the skills of reading and writing, digital literacy requires the ability to extend those skills in order to effectively take advantage of the digital world (ALA, 2013). More general definitions express digital literacy as the ability to read and understand information from digital sources as well as to create information in various digital formats (Bawden, 2008; Gilster, 1997; Tyner, 1998; UNESCO, 2004). Developing digital skills allows digital learners to manage a vast array of rapidly changing information and is key to both learning and working in an evolving digital landscape (Dede, 2010; Koltay, 2011; Mohammadyari & Singh, 2015). As such, it is important for people to develop certain competencies specifically for handling digital content.

People who adapt well to the digital world exhibit characteristics enabling them to develop and maintain digital literacy skills. Lifelong learning is a key characteristic necessary for handling rapid changes in technology and information and thus, critical to digital literacy. Successful digital learners have a high level of self-motivation, a desire for active modes of learning and they exercise the ability to learn how to learn. Maintaining and learning new technical skills also benefits learners in the digital age and an attitude of exploration and play will help learners stay engaged and energized in a world where speed of change and volume of information could otherwise become overwhelming (Dede, 2010; Jenkins, 2018; Visser, 2012). A final characteristic of a digital learner includes the ability to engage in a global network with a greater awareness of one's place and audience in that network. Together, these characteristics of the digital age guide us in understanding what traits a learner will require to be successful in the digital environment. The following section will help understand what lies at the intersection of digital skills and traits of successful digital learners by reviewing existing digital literacy frameworks.

Reviewing Existing Frameworks for Digital Literacy/ies

Digital literacy is alternately described as complicated, confusing, too broad to be meaningful and always changing (Heitin, 2016; Pangrazio, 2014; Tyner, 1998; Williams, 2006). Due to this confusion, some feel it best to completely avoid the term digital literacy altogether and instead opt for the terms such as digital competencies (Buckingham, 2006), 21st century skills (Williamson, 2011) or digital skills (Heitin, 2016). Another way to sort out the confusion is to look at digital literacy as multiple literacies (Buckingham, 2006; Lankshear & Knobel, 2008; UNESCO, 2004)

Here, I take the latter approach and look at digital literacy as a collection of literacies each of which play a significant role in learning in a digital world. Ng (2012), operationalizes digital literacy as a framework of multiple, specific competencies which, when combined, form a cohesive collection of skills. By taking this approach, we link the characteristics of the digital environment as well as those of the digital learner not to a single digital skill but rather a set of digital literacy practices. In this way, we can consider the various skills needed to navigate the digital world in an organized and consistent manner.

Ng (2012) proposes a three-part schema for discussing the overlapping functional characteristics of a digitally competent person: technical, cognitive, and social (see Figure 1).

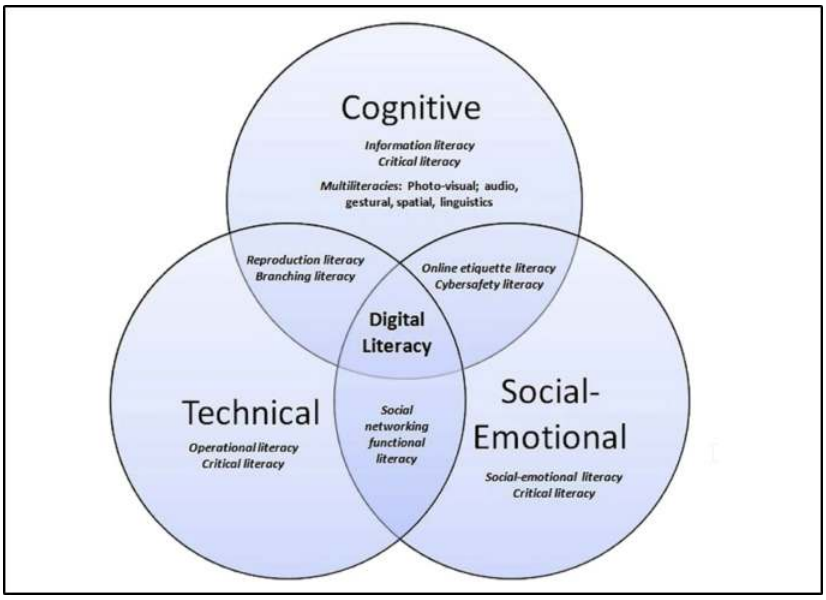


Figure 1. Underlying foundation of digital literacy includes technical, cognitive and social skills (Ng, 2012).

Technical literacy, also referred to as operational literacy, refers to the mastery of technical skills and tasks required to access and work with digital technology such as how to operate a computer; use a mouse and keyboard; open software; cut, copy and paste data and files, acquire an internet connection and so on (Lankshear & Knobel, 2008). The cognitive area of digital literacy focuses on activities such as critical thinking, problem solving and decision making (Williamson, 2011) and includes the ability to "evaluate and apply new knowledge gained from digital environments"(Jones-Kavalier & Flannigan, 2006, p. 5). The third of Ng's three categories – social literacies – covers a wide range of activities which together constitute the ability to communicate in a digital environment both socially and professionally, understand cyber security, follow "netiquette" protocols, and navigate discussions with care so as not to misrepresent or create misunderstandings (Ng, 2012). Of particular note, Ng captures the essence of digital literacy by showing how digital literacy exists at the intersection of the technical, cognitive and social aspects of literacy which are referred to as dimensions. Ng's framework is not, however, a digital literacy framework itself. Instead it provides a vehicle for exploring the various components of digital literacy at a conceptual level while remaining clear that the individual skills are at all times connected to and dependent upon each other.

There are a number of organizations that publish their own framework for digital literacies including the International Society for Technology in Education ICT Skills (ISTE), the American Association of College and Universities (AACU), the Organization for Economic Cooperation and Development (OECD), the American Library Association (ALA), and the Partnership for 21st Century Skills among others (Dede, 2010). The digital frameworks exhibit many similarities, and a few differences. There are some differences in the terminology and organization of these frameworks, but they all include similar skills. What follows is a brief overview of the different digital frameworks. See Figure 2 for a composite of these frameworks.

Partnership for 21st Century Skills (P21)	• Core subjects • 21st century content • Learning and thinking skills • ICT Literacy
American Association of College and Universities	• Knowledge of Human Cultures and the Physical and Natural World • Intellectual and Practical Skills • Personal and Social Responsibility
International Society for Technology in Education ICT Skills	• Creativity and innovation • Communication and Collaboration • Research and Information Fluency • Critical Thinking, Problem Solving, and Decision Making
Educational Testing Service	• Access • Manage • Integrate • Evaluate
Society of College, National, and University Libraries (UK)	• Constructing strategies for locating information • Locating and accessing the information sought • Comparing and evaluating information obtained from different sources • Organizing, applying and communicating information • Synthesizing and building upon information
American Library Association	• Finding • Understanding • Evaluating • Creating

Figure 2. Major Frameworks for 21st Century Skills (American Library Association, 2013; Dede, 2010; SCONUL, 2016; Vockley & Lang, 2008)

Each of the frameworks come from a slightly different angle and will at times reflect the background from which they come. The American Library Association (ALA) framework evolved out of the information literacy tradition of libraries, while the American Association of College and Universities (AACU) and the Society of College and University Libraries (SOCNUL) evolved from higher education perspective, the Partnership for 21st century learning addresses K-12 education, and the ISTE is steeped in a more technical tradition. Even with these different areas of focus the components of each framework are strikingly similar although some in more detail than others. Three of the six specifically address the skills necessary for accessing, searching and finding information in a digital environment while the other three have broader categories in which one might expect to find these skills including, research and information fluency, intellectual skills, and ICT literacy. Cognitive skills required for digital literacy are also covered by all of the frameworks in varying degrees of specificity. Among them one will find references to evaluating, understanding, creating, integrating, synthesizing, creativity and innovation. Finally, four of the six digital frameworks pay homage to the necessity of solid communication skills. They are in turn, referred to as life skills, personal and social responsibility, communication, collaboration, digital citizenship and collective intelligence.

What seems oddly missing from this list of skills is the technical component which only appears explicitly in the ISTE list of skills. The partnership for 21st century learning uses ICT literacy as a designation for the ability to use technology and the ALA, in discussing its framework, makes it clear that technical proficiency is a foundational requirement for digital literacy skills. Even with these references to technical skills the digital literacy frameworks are overwhelmingly partial to the cognitive and social focus of digital skills and technical proficiency tends to be glossed over compared to the other dimensions. Even though technical skills receive relatively little attention by comparison we will assume for this discussion, technical skills are a prerequisite to the other digital skills, and we will look more carefully at each of them in the next section.

To fully understand the many digital literacies, we will use the ALA framework as a point of reference for further discussion using the other frameworks and other materials to further elucidate each skill area. The ALA framework is laid out in terms of basic functions with enough specificity to make it easy to understand and remember but broad enough to cover a wide range of skills. The ALA framework includes the following areas:

- Finding,
- Understanding,
- Evaluating,
- Creating, and
- Communicating
  (American Library Association, 2013).

Finding

Finding information in a digital environment represents a significant departure from the way human beings have searched for information for centuries. The learner must abandon older linear or sequential approaches to finding information such as reading a book, using a card catalog, index or table of contents and instead use lateral approaches like natural language searches, hypermedia text, keywords, search engines, online databases and so on (Dede, 2010; Eshet, 2002). The shift from sequential to lateral involves developing the ability to construct meaningful search parameters (SCONUL, 2016) whereas before, finding the information would have meant simply looking up page numbers based on an index or sorting through a card catalog. Although finding information may depend to some degree on the search tool being used (library, internet search engine, online database, etc.) the search results also depend on how well a person is able to generate appropriate keywords and construct useful Boolean searches. Failure in these two areas could easily return too many results to be helpful, vague or generic results, or potentially no useful results at all (Hangen, 2015).

Not immediately obvious, but part of the challenge of finding information is the ability to manage the results. Because there is so much data, changing so quickly, in so many different formats it can be challenging to organize and store it in such a way as to be useful. SCONUL (2016) talks about this as the ability to organize, store, manage and cite digital resources while the Educational Testing Service also specifically mentions the skills to access and manage information. Some ways to accomplish these tasks is through the use of social bookmarking tools such as Diigo, clipping and organizing software such as Evernote and OneNote, and bibliographic software. Many sites, such as YouTube allow individuals with an account to bookmark videos as well as create channels or collections of videos for specific topics or uses. Other websites have similar features.

Understanding

Understanding in the context of digital literacy perhaps most closely resembles traditional literacy in so much as it too, is the ability to read and interpret text (Jones-Kavalier & Flannigan, 2006). In the digital age, however, the ability to read and understand extends much further than text alone. For example, searches may return results with any combination of text, video, sound, and audio as well as still and moving pictures. As the internet has evolved, there have evolved a whole host of visual languages such as moving images, emoticons, icons, data visualizations, videos and combinations of all of the above. Lankshear & Knoble, (2008) refer to these modes of communication as “post typographic textual practice”. Understanding the variety of modes of digital material may also be referred to as multimedia literacy (Jones-Kavalier & Flannigan, 2006), visual literacy (Tyner, 1998), and digital literacy (Buckingham, 2006).

Evaluating

Evaluating digital media requires competencies ranging from evaluating the importance of a piece of information to determine its accuracy and its source. Evaluating information is not new to the digital age, but the nature of digital information can make it more difficult to understand who the source of information is and whether it can be trusted (Jenkins, 2018). When there is abundant and rapidly changing data across heavily populated networks, anyone with access can generate information online, making decisions about its authenticity, trustworthiness, relevance, and significance daunting. Learning evaluative digital skills means learning to ask questions about who is writing the information, why they are writing it, and who the intended audience is (Buckingham, 2006). Developing critical thinking skills is part of the literacy of evaluating and assessing the suitability for the use of a specific piece of information (SCONUL, 2016).

Looking for secondary sources of information can help confirm the authenticity and accuracy of online data and researching the credentials and affiliations of the author is another way to find out more about whether an article is trustworthy or valid. One may find other places the author has been published and verify they are legitimate. Sometimes one may be able to review affiliated

organizations to attest to the expertise of the author such finding out where an employee works if they are a member of a professional organization or a leading researcher in a given field. All of these provide essential clues for use in evaluating information online.

Creating

Creating in the digital world makes explicit the production of knowledge and ideas in digital formats. While writing is a critical component of traditional literacy, it is not the only creative tool in the digital toolbox. Other tools are available and include creative activities such as podcasting, making audio-visual presentations, building data visualizations, 3D printing, writing blogs and new tools that haven't even been thought of yet. In short, all formats in which digital information may be consumed, a digitally literate individual will also want to be able to use in the creation of a product. A key component of creating with digital tools is understanding what constitutes fair use and what is considered plagiarism. While this is not new to the digital age, it may be more challenging to find the line between copying and extending someone else's work.

In part, the reason for the increased difficulty of finding the line between plagiarism and new work is the "cut and paste culture" of the internet referred to as "reproduction literacy" (Eshet 2002, p.4) also referred to as appropriation in Jenkins' New Media Literacies (Jenkins, 2018). The question is, what can one change and how much can one change work without being considered copying? This skill requires the ability to think critically, evaluate a work and make appropriate decisions. There are tools and information to help understand and find those answers such as the creative commons. Learning about these resources and learning how to use them is part of this digital literacy.

Communicating

Communicating is the final category of digital skills in the ALA digital framework. The capacity to connect with individuals all over the world creates unique opportunities for learning and sharing information for which developing digital communication skills is vital. Some of the skills required for communicating in a digital environment include digital citizenship, collaboration, and cultural awareness. This is not to say that one does not need to develop communication skills outside of the digital environment but that the skills required for digital communication go beyond what is required in a non-digital environment. Most of us are adept at personal, face to face communication but digital communication needs the ability to engage in asynchronous environments such as email, online forums, blogs and social media platforms where what we say can't always be deleted but can be easily misinterpreted. Add that to an environment where people number in the millions and the opportunities for misunderstandings and cultural miscues are much more likely.

The communication category of digital literacies covers an extensive array of skills above and beyond what one might need for face to face interactions. It includes competencies around ethical and moral behavior, responsible communication for engagement in social and civic activities (Adam Becker et al., 2017), an awareness of audience and an ability to evaluate the potential impact of one's actions online. It also includes skills for handling privacy and security in online environments. These activities fall into two main categories of activity including digital citizenship and collaboration.

Digital citizenship refers to one's ability to interact effectively in the digital world. Part of this skill is good manners, often referred to as "netiquette. There is a level of context which is often missing in digital communication due to physical distance, lack of personal familiarity with people online and the sheer volume of people who may come in contact with our words. People who know us well may understand exactly what we mean when we say something sarcastic or ironic, but those and other vocal and facial cues are missing in most digital communication making it more likely we will be misunderstood. Also, we are also more likely to misunderstand or be misunderstood if we remain unaware of cultural differences amongst people online. So, digital citizenship includes an awareness of who we are, what we intend to say and how it might be perceived by other people we do not know (Buckingham, 2006). It is also a process of learning to communicate clearly and in ways that help others understand what we mean.

Another key digital skill is collaboration, and it is essential for effective participation in digital projects via the internet. The internet allows people to engage with others we may never see in person and work towards common goals be they social, civic or business oriented. Creating a community and working together requires a degree of trust and familiarity that can be difficult to build given the physical distance between participants. Greater awareness must be paid to inclusive behavior, and more explicit efforts need to be made to make up for perceived or actual distance and disconnectedness. So, while the promise of digital technology to connect people is impressive it is not necessarily an automatic transition, and it requires new skills.

Parting thoughts.

It is clear from our previous discussion of digital literacy that technology and technical skills underpin every other digital skill. A failure to understand hardware, software, the nature of the internet, cloud-based technologies and an inability to learn new concepts and tools going forward handicaps one's ability to engage with the cognitive and social literacies. While there are sometimes tacit references to technical skills and ability, extant digital literacy frameworks tend to focus more on the cognitive and social aspects of digital environments. There is an implied sense that once technical skills are learned, we the digitally literate person can forget about them and move on to the other skills. Given the rapid pace of technological change in the last 40 years, however, anyone working in a digital environment would be well advised to keep in mind that technical concepts and tools continue to develop. It does not seem likely that we will ever reach a point where people can simply take technological skills for granted and to do so would undermine our ability to address the other digital skills.

Another way to think of this is to recognize that no matter what the skill, none of them operate independently of one another. Whether searching, creating, evaluating, understanding or communicating, it is a combination of skills (or literacies) that allow us to accomplish our goals. Thinking critically, and evaluating information and sources leads to sound decision-making. Understanding and synthesizing information is necessary for creating and again the technical tools are necessary for completing the product. Finding information is of little use if one is unable to analyze its usefulness and creating a great video or podcast will not mean much if one is unable to navigate social and professional networks to communicate those works to others. If only understood in isolation, digital literacies have little meaning and can be of little use in approaching digital environments.

Ng's (2012) conceptual framework reminds us that digital literacy is that space where technical, cognitive and social literacies overlap. A digital skill is not the same thing as digital literacy but the two are fully intwined. Acquiring digital skills is only the beginning of a study of digital literacies, however, and it would be a mistake to stop here. Furthermore, digital literacies span multiple areas including both the cognitive and the social. The real value of digital literacy lies in understanding the synergistic effect of individual digital literacy skills integrated with sets of competencies that enable one to work effectively in the digital world.

Learning Activities.

Literacy Narratives are stories about reading and composing in any form or context. They often include poignant memories that involve a personal experience with literacy. Digital literacy narratives can sometimes be categorized as narratives that focus on how the writer came to understand the importance of technology in his/her life or teaching pedagogy. More often, they are simply narratives that use a medium beyond the print-based essay to tell the story.

Kairos: A Journal of Rhetoric, Technology, and Pedagogy, 20(1), available at http://kairos.technorhetoric.net/20.1/praxis/bourelle-et-al

1. Combining both aspects of the genre, write a piece based on your technological literacy, choosing a medium you feel best conveys the message you want to share with your audience.
2. Find and read 2-4 literacy narratives online that emphasize the use of technology and write a short reflection that discusses the main digital literacies used, summarizes the main points made and describes the elements you felt were most important. Also, describe any digital literacy skills you utilized to complete the assignment.
3. Create your literacy narrative that tells the story of a significant experience of your own with digital literacy. Use a multi-modal tool that includes audio and images or video. Share with your classmates and discuss the most important ideas you noticed in others' narratives.
4. Compare two of the literacy frameworks in Figure 2. How are they alike? How are they different? Do you like one better than the other? Why or Why not?

Resources.

1. Multi-Media Resources about Digital Literacy
   - Digital Literacy and why it matters – https://www.youtube.com/watch?v=p2k3C-iB88w
   - The essential elements of digital literacies https://www.youtube.com/watch?v=A8yQPoTcZ78
   - What is a Literacy Narrative? https://www.youtube.com/watch?v=_Mhl2j-cpZo
   - Benji Bissman's computer literacy narrative – http://daln.osu.edu/handle/2374.DALN/2327
2. Digital Literacy Standards
   - Global Digital Literacy Council

- International Society for Technology in Education

3. Literacy Resources and Training
   - Information and Communication Technologies
4. Resource Library
   - Education Development Center, Inc.
5. Visual Literacy Resources
   - International Visual Literacy Association
6. Digital Literacy Fundamentals
   - http://mediasmarts.ca/digital-media-literacy-fundamentals/digital-literacy-fundamentals
7. Microsoft Digital Literacy
   - https://www.microsoft.com/en-us/digitalliteracy/overview.aspx
8. 12 Essentials of Digital Literacy
   - .http://info.learning.com/hubfs/Corp_Site/Sales%20Tools/12EssentialSkills_Brochure_Apr16.pdf
9. US Digital Literacy
   - http://www.digitalliteracy.us
10. What are literacy skills?
    - https://k12.thoughtfullearning.com/FAQ/what-are-literacy-skills

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CHAPTER OVERVIEW

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5.1: Software Simulation Tools

There are numerous tools designed specifically for the simulation of computer screens by recording screen interactions. For example:

- Adobe Captivate (formerly Macromedia RoboDemo)
- TechSmith Camtasia
- Qarbon ViewletBuilder

Many of these also do PowerPoint to Flash conversion.

Test and Assessment Tools

Most course authoring tools can create and deliver tests and quizzes as part of the courses. Instructors may also want use test banks that publishers provide, and/or other, more powerful tools built specifically for testing. For example:

- Questionmark Perception
- Respondus
- Hot Potatoes

There are well over 100 available sources for software that can be categorized as course authoring tools. When choosing an LMS, be sure that it can support any third-party generic courseware or content authoring tools being used. Particular attention should be paid to the LMS's ability to launch the courses, and track and record interactions and responses to quizzes. Support for standards helps, but it is no guarantee. You should test the LMS with the tools and courseware that you will be using. You should also determine how accessible the file formats are for students with disabilities. (See Chapter 11, Accessibility and Universal Design, for more information about accessibility.)

> **Tip**
>
> Be careful with rapid development tools. Speed of delivery can be very important but make sure you are not just making bad Word or PowerPoint documentation into even worse e-learning courses.

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SECTION OVERVIEW

5.2: Computer-Based Games for Learning

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5.2.1: Introduction

Learning outcomes

- Define game, simulation and simulation game and give examples of each.
- Describe the theoretical arguments for using computer-based games for learning.
- Describe features of computer-based games for learning that contribute to their effectiveness.
- Describe possible approaches to implementing computer-based games for learning in your context.
- Describe possible approaches to creating your own games for learning.

Computer-based games are a major entertainment and cultural force (Gamasutra, 2006). Creative ideas using sophisticated graphics and communication technologies are changing the way we spend our leisure time, build friendships and communities, try out new identities, and practise new skills. Whether or not computer-based games are part of your daily life, they offer tremendous opportunities to engage and challenge your students.

You may be a gamer, familiar with the Xbox, Grand Theft Auto, and EverQuest,, and wondering why school isn't as absorbing as your late-night game sessions. You may be a boomer professor, curious but not sure how games could be relevant to your teaching. Or you may be somewhere in between.

This chapter gives you a broad introduction to the use of computer-based games for learning. We start with basic terms and move on to look at why these activities can be powerful learning tools, drawing on current learning theory, game research, and recent experience. After presenting examples to spark your own learning-game ideas, we discuss factors that make learning games effective. The chapter closes with tips for successfully getting started using games in your learning context.

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5.2.2: “Square One” - What are We Talking About?

Because the word “game” can describe many very different activities and varieties of play, we start with a few definitions. Speaking very generally,

> A game is a set of activities with goals, rules, and competition (possibly with oneself) that involve one or more players in an artificial situation (Dempsey et al., 1996; Sauvé et al., under review).

Games such as tennis, basketball, Tic Tac Toe, chess, checkers, and Monopoly have been around much longer than computers. Since personal game machines and computers have become widely available, a wide variety of dynamic, interactive electronic games have appeared in many genres. Some familiar titles are the Carmen Sandiego series, Myst, Doom, various sports games, and EverQuest.

Many computer-based games are based on simulations, for example: The Sims, Roller Coaster Tycoon, or MBA management training games.

> A simulation is a dynamic, simplified but accurate systems model of aspects of reality (Sauvé et al., under review).

Simulations in which learners have defined roles, with responsibilities, constraints, and feedback in complex data-rich environments, allow them to develop problem-solving skills and experience the effects of their decisions (Gredler, 2004). Simulations are often useful because they let players learn from their mistakes without, for example, crashing planes, killing patients, or sending companies into bankruptcy.

Adding performance goals, scoring, and competition among players or with oneself can turn a simulation into a game (Sauvé et al., under review; Sauvé et al., 2005a). The term simulation game refers to these hybrids and includes a wide variety of commercial games that simulate real-world activities. The distinction among games, simulations, and simulation games is important as a foundation for studies relating learning outcome effectiveness to characteristics of the learning activity (Sauvé et al., under review).

Games can use a variety of technologies including boards and tokens, fields and balls, dedicated game machines (PlayStation, Xbox, Nintendo DS), personal computers, and handheld devices (cell phones, personal digital assistants [PDAs]). In this chapter we focus on games for computers and handhelds.

An Internet search will lead you to games for learning in practically any discipline. Some examples, found on the Social Impact Games site (www.socialimpact games.com), include:

- education games covering school subjects such as algebra, history, chemistry, computer software, and criminology;
- public policy games designed to educate the public on citizenship, democratic participation, and policy issues, such as Cyberbudget France on the French national budget, and several US election-related games;
- political and social games designed to stimulate discussion or promote views on world issues (e.g., world agriculture, drug dealing, human rights);
- health and wellness games teaching about health issues and management (e.g., for asthma, cancer, heart health, child predators, and self-esteem); and
- learning applications of commercial games: job simulations (e.g., emergency room), resource management (SimCity, Railroad Tycoon), history (e.g., Oregon Trail, Rise of Nations).

Similarly, simulation applications are many and varied, including:

- business: Computational models that generate business results and provide feedback for practising planning and decision-making for simulated periods (e.g., months, years). Goals are often profit-related. Areas include strategic management, marketing, finance, operations, investments; specific industry simulations, e.g., the Cornell Management Game (www.cms - training.com/);
- public policy: Simulations of government, educational, or international organizations or scenarios, e.g., Virtual U university management simulation (www.virtual-u.org/);
- military training: War strategy, equipment, battle, support scenarios, e.g., America’s Army, a virtual online army simulation (aimed at recruiting) produced by the US government (www.americasarmy .com/);
- flight: Simulations of specific aircraft controls, airports, flight paths, e.g., CAE commercial training simulators (http://www.cae.com); PC-based flight simulators (http://www.pcaviator.com or http://www.microsoft .com/games/flightsimulator/);

- medicine: Physical or computer-based models of medical processes and problems for developing and testing clinical skills, e.g., patient simulators, surgical simulators (http://www.msr.org.il/About_MSR/Medical _Simulation_Equipment/);
- memergency response: Immersive emergency scenarios and environments for testing systems and decisions, e.g., Unreal Triage (http://www.ists.dartmouth.edu /projects/seers/utriage.php); and
- leadership development: Simulated scenarios for practising interpersonal and leadership skills, such as Virtual Leader (www.simulearn.net/leadership training.html), Change Game (www.vanderbilt .edu/lead/simulations.html).

For the rest of this chapter, we will be concerned with games, simulation games and game-like simulated environments that involve play, exploration, and problemsolving but may or may not required explicit scoring and competition. In common with the popular use of the term, we will use “games” to refer to them collectively. Training simulations that are specifically oriented towards technical skills development, e.g., flight simulators and medical patient simulators are beyond the scope of this discussion.

Computer-based games are played by individuals and groups in many configurations. They can be single- or multi-player, played on a single computer, or multiple networked machines, in classrooms, or online. Handheld games can also support individual learning or collaborative learning with teams and groups, and particularly lend themselves to games involving player movement around physical settings. Internet-based massively multiplayer online games (MMOGs) attract thousands of players in complex, evolving interactions and scenarios, including ones created by players themselves. Computers and especially handhelds can also be used to support blended learning situations in which game play happens through face-to-face interactions and activities rather than on screens.

Example 5.2.2.1

Second Life is a virtual online world built by its “residents” and populated by their avatars (online characters). It includes a dedicated campus area where educators can build and offer virtual classes including simulations. Here learners can “use simulation in a safe environment to enhance experiential learning, allowing individuals to practise skills, try new ideas, and learn from their mistakes. Students and educators can work together in Second Life from anywhere in the world as part of a globally networked virtual classroom environment.” (http://secondlife.com/community/education.php)

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5.2.3: Why Use Computer-Based Games for Learning?

Several factors have recently converged to propel learning applications for computer-based games.

Popularity and Access

First, games are widely popular and accessible as entertainment; the Canadian video game market will increase from $732 million in 2005 to $1.3 billion in 2010, while global video game spending is expected to rise from $27.1 billion in 2005 to $46.5 billion in 2010 (Forest, 2006). A 2002 US survey found that 92 percent of children and adolescents ages 2 to 17 played video games, and more than two-thirds of all children ages 2 to 18 lived in a home with a video game system (Kaiser Family Foundation 2002). As well, 61 percent of Canadian households and 75 percent of US households used mobile phones in 2005 (Wright, 2006). Using games for learning builds on their familiarity and relatively easy access.

Player Engagement

Computer games are highly engaging. Today's games offer motivating, absorbing, interactive, collaborative experiences that draw in players and keep them playing for many hours, often developing complex social networks in the process.

A growing body of literature analyzes aspects of games that foster player engagement and motivation. Asgari and Kaufman (2004) cite three categories of factors that sustain a game's intrinsic motivation so that a player will play for his/ her own interest and enjoyment, even in the absence of external rewards:

Table 5.2.3.1: Intrinsically Motivating Features of Games (Asgari & Kaufman, 2004)

Feature Category	Examples
Psychological: those that meet individual needs	Features that meet needs for competence, self-determination, interest-excitement, enjoyment.
Structural: related to the inner structure of a game	Complexity, novelty, unpredictability, uncertain outcomes, challenge, feedback, fantasy, curiosity, control, interactivity, competition
Implementation: related to the way a game is implemented and presented to the player	Graphics and sound, having multiple players, using well-known characters or settings, high speed, useful interface, "save game" capability

Prensky (2001a) lists twelve elements that make computer games engaging:

Table 5.2.3.2: Twelve Elements that make Computer Games Engaging (Prensky (2001a), quoted in Mitchell & Savill-Smith, 2004)

Game Characteristic	Contribution to Players' Engagement
Fun	Enjoyment and pleasure
Play	Intense and passionate involvement
Rules	Structure
Goals	Motivation
Interaction	Doing the activity
Outcomes and feedback	Learning
Adaptive	"Flow" state
Winning	Ego gratification
Conflict/competition/ challenge and opposition	Adrenaline
Problem solving	Sparks creativity
Social interaction	Social groups

Game Characteristic	Contribution to Players' Engagement
Representation and a story	Emotion

Another analysis of games' engaging quality focuses on players' experience of "flow", a state of intense concentration and focus in which they have a balance between ability level and challenge, a sense of personal control over the situation, and a sense of intrinsic reward from the play (Csikszentmihalyi, 1990). Welldesigned games do this by, among other things, having multiple skills levels so that players face new but achievable challenges as they develop mastery of lower levels.

Gee (2003) explains player engagement in terms of semiotic domains (worlds of symbols, meanings, practices, and experiences). He points out that games can be very challenging and time-consuming, yet young players who might spend little time on schoolwork become absorbed in games and learn complex knowledge, responses, and behaviours in order to win. In his words,

> A game like Pikmin recruits from our six-year-old a complex identity composed of various related traits. The game encourages him to think of himself as an active problem solver, one who persists in trying to solve problems even after making mistakes; one who, in fact, does not see mistakes as errors but as opportunities for reflection and learning. It encourages him to be the sort of problem solver who, rather than ritualizing the solutions to problems, leaves himself open to undoing former mastery and finding new ways to solve new problems in new situations.

Gee suggests that players take on and master lengthy, complex games because they become involved in new semiotic domains and affinity groups, resulting in new identities (e.g., a game character with abilities, faults, and decisions to be made) and situated learning that can be transferred to other domains. Squire (2005) suggests that this focus on new identities is leading to new computer-based games that build new attitudes and behaviours for players in simulated management and advertising settings.

Theory-Based Support

Computer-based games embody current learning theories. For example,

- Constructivist learning (Boethel & Dimock, 1999; Vygotsky, 1978): When requiring exploration, collaboration, and complex problem-solving, games can help players to explore, discover, articulate, and create their own understanding of complex phenomena;
- Situated cognition, cognitive apprenticeship, and experiential learning (Kolb, 1984; Schank & Neaman, 2001): When they create simulated authentic contexts and activities that involve social interaction, games can support both understanding and skill development. Also, skill development increases with learning by doing, and feedback in a safe environment;
- Self-efficacy (Bandura, 1986; Kaufman et al., 2000): Through learner control and increasing achievement levels, games can provide opportunities for successful experiences to help develop self-efficacy and positive attitudes concurrently with knowledge and skills.
- Learner-cent-redness (McCombs and Whistler, 1997): Games can transform traditional teacher and learner roles so that learners shift from a passive to an active role, and from learner to teacher through active exploration, experimentation, discovery, and collaboration with peers.

Evidence of Learning Outcomes

A number of studies have demonstrated the effectiveness of games for cognitive, emotional and psychomotor learning. For examples, see Baranowski et al. (2003), Kirriemuir & McFarlane (2004), Lieberman (2001), Roubidoux (2002), Sauvé et al. (2005b), and Steinman & Blastos (2002). According to these, games motivate learning, offer immediate feedback, consolidate knowledge, support skills development and application, aid learning transfer, and influence changes in behaviour and attitudes, all pointing to greater learning effectiveness with simulations and games.

New-Generation Learning Model

Finally, some observers argue that new generations of learners are developing new cognitive processes and a culture that is changing the nature of learning. Learning may be evolving into a much more "unruly," less controlled process than we have been accustomed to in our classrooms (Seely Brown, 2002). Prensky (2001a) and others suggest that the "game generation" has developed a new cognitive style characterized by multitasking, a short attention span, and learning through exploration and discovery; today's games provide their ideal learning environment.

Example 5.2.3.1

Case studies of Lineage (Steinkuehler, 2004) and World of Warcraft (Lau, 2005) describes how these MMOGs develop online communities of practice that foster learning as social practice through “situated understandings, effective social practices, powerful identities, shared values, and shared ways of thinking” (quote from Lau, 2005).

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5.2.4: Game-Based Learning Examples

To move from theory into practice, some concrete examples show how games are being used for learning from K–12 through university and professional training levels.

- Educational Games Central: A pioneer in the use of computer-based games for learning, the Carrefour virtuel du jeux éducatifs, operated by the SAVIE research centre at the Université du Québec à Montréal, has recently been translated into English as Educational Games Central (EGC). The site (www.savie.qc .ca/carrefourjeux/an/accueil.htm) provides “frame games”—generic frameworks for well-known board games and game-show contests (e.g., Tic Tac Toe, Trivial Pursuit, Concentration, Snakes and Ladders) into which questions, problems, answers, and feedback can be entered to create specific games in any content area. Because each game shell is designed to let a teacher produce a game in an hour or two (once the content is developed), EGC can be used in the classroom or in a training context without extensive training or infrastructure. Its games are accessed on the Internet by individual players or teams; the newly released ENJEUX multiplayer environment (http:// www.savie.ca/enjeux) supports their use for multiple players online at different sites. Performance and research statistics can be collected for each play session. Although EGC games are based on more traditional question-and-answer exercises, they have proved very successful in using play and competition to engage learners from young children to adults. EGC games have recently been used for several health-related applications as part of the SAGE for Learning research project (www.sageforlearning .ca) on games and simulations for learning.
- COTS games in the schools: Commercial off-theshelf (referred to as COTS) games have being applied in many learning contexts. In one example, a school in the US reports using Roller Coaster Tycoon projects to teach momentum, speed, mass, and other concepts in junior-high physics classes (Kirremuir, 2006a). In another case, SimCity is being used for a complex Grade 6 to 8 project to create and manage a small city’s infrastructure and environmental impact (Kirriemuir, 2006b). In a third example, the Education Arcade project at MIT used Civilization III to teach high school and middle school social studies. The researchers found that students used much more complex concepts than expected. One student commented, “What I learned is that you can’t separate economics from politics or geography. What natural resources I have or where I’m located affects how I can negotiate with other civilizations.” (Jenkins & Squire, 2003).
- University, adult and professional learning: A project at Purdue University is building the Critical Mass video game to teach university chemistry through an adventure mission that requires solving chemistry problems (web.ics.purdue.edu/~kmartine/). Virtual-U (www.virtual-u.org/) lets players experience the intricacies of university management. Public Health Games (www.publichealth games.com/), a centre at the University of Illinois at Chicago, is creating “state of the art games for public health workers and emergency responders for a multitude of catastrophic scenarios,” including an anthrax attack response simulation. The Objection! simulation (http://www.objection.com/), customizable for any state’s legal system, is used in US law schools to teach trial skills and is approved for continuing legal education.
- Mobile games: Naismith et al. (2004) use case studies to review how a number of mobile games implement current learning theories. One example is Environmental Detectives (http://education.mit.edu/ar/ed .html), an augmented reality game, in which Grade 5 to 8 students use a constructivist approach, playing the role of environmental engineers searching for data to solve problems related to a toxic chemical spill. Simulation events are triggered by real-world locations as players navigate through a physical space.

Note

Search the Internet to find examples for your discipline. Some sites to start you off are the FutureLab showcase (http://www.futurelab.org.uk/showcase /show.htm), BBC Schools (http://www.bbc.co.uk /schools/games/), FunBrain.com (www.fun brain.com/), and the EDUCAUSE Games and Simulations page (www.educause.edu/Games andSimulations/11263).

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5.2.5: What Makes A Learning Game Effective?

As with other new learning technologies, it is important to separate hype from reality. Not all game-based learning trials are successful, for reasons related to a game's design, fit with learning objectives, role within the larger learning context, technology support, and other factors. However, experience and research are developing a growing body of knowledge about features and practices that contribute to game-based learning success.

Game Design

Well-designed learning games aim to achieve engagement levels similar to entertainment games, which keep players involved for many hours of increasingly complex exploration and step-by-step achievement.

Gee (2003, pp. 62–63) argues that "learners must be enticed to try even if afraid, must be enticed to put in lots of effort even if initially not motivated to do so, and must achieve some meaningful success when he or she has expended this effort". He suggests that good video games do this by incorporating the following principles (pp. 137–138):

Table 5.2.5.1: Selected Learning Principles in Successful Video Games (Gee, 2003)

Learning Principle	Explanation
Subset principle	Learning even at its start takes place in a (simplified) subset of the real domain.
Incremental principle	Learning situations are ordered in the early stages so that earlier cases lead to generalizations that are fruitful for later cases. Choices in later complex cases are constrained by what the player has found earlier.
Concentrated sample principle	The learner sees and can practise and learn (especially early in the game) many instances of fundamental signs (meanings) and actions.
Bottom-up basic skills principle	Basic skills are discovered bottom up by engaging more and more in the game.
Explicit information on-demand and just-in time	The learner is given explicit information what is needed just at the point where it can best be understood and used in practice.
Discovery principle	Most learning happens through experimentation and discovery rather than through telling.
Transfer principle	Learners are given ample opportunity to practise, as well as support for transferring what they have learned earlier to later problems

The flow concept offers additional game design help. According to Malone (1980), flow happens in activities in which players can increase or decrease the level of challenge to exactly match their skill levels; they can obtain increasingly complex information through a broad range of challenges, some qualitatively different; they have clear performance criteria and feedback so that they can always tell how well or poorly they are doing; and the activity is free from distracting stimuli that might interfere with their involvement. Evaluating games in terms of flow naturally leads us to look for games with:

- multiple challenge levels that adapt as players learn;
- clear goals and easily interpreted, frequent feedback; and
- a variety of game tasks and activities to avoid the boredom we frequently associate with more traditional learning technologies.

Other features that help to make games engaging (Becta, 2001; Dickey, 2005; Fabricatore, 2000; Mitchell & Savill-Smith, 2004; Prensky, 2001a) include:

- dynamic visuals, interaction, rules and goals (although games can be successful without highly complex virtual reality graphics);
- naturally embedded (rather than external) learning content with contextual relevance;

- simple startup and rules to provide early success and minimize frustration;
- game pace and length matched to the target audience;
- opportunities to exercise the arcade game skills of the "gaming generation";
- opportunities to make many decisions and correct and learn from errors;
- use of first-person point of view, i.e., making the player part of the gaming environment;
- use of narrative (story) to provoke curiosity and give opportunities for creativity, choice and control;
- using physical, temporal, environmental, emotional and ethical dimensions to provide players with a sense of immersion; and
- using compelling characters (or let players create their own) with which players empathize and identify.

Beyond analyzing a game's features, Prensky (2001a) suggests that observing players can help us identify an engaging game:

- Is the game fun enough that someone who is not in its target audience would want to play and learn from it?
- Do people using it think of themselves as "players" rather than "students' or trainees"?
- Is the experience addictive? Do users want to play again and again until they win, and possibly after?
- Are the players' skills in the subject matter and learning content of the game improving at a rapid rate, and getting better the longer he or she plays?
- Does the game encourage reflection about what has been learned?

Fit with Learning Objectives

Games can be used to support a variety of learning objectives. Garris et al. (2006) provide a useful review of possible game learning outcomes.

Table 5.2.5.2: Game Learning Outcomes (Garris et al., 2006)

Outcome Type	Description
Cognitive	
Declarative	Knowledge of the facts and data required for task performance
Procedural	Knowledge about how to perform a task
Strategic	Ability to apply rules and strategies to general or novel cases
Affective	Beliefs or attitudes regarding an object or activity, e.g., feelings of confidence, self-efficacy, attitudes, preferences, and dispositions
Skill-based	Performance of technical or motor skills

Clearly a key question in selecting or designing a game is how well it fits with the objectives you have in mind. Here are some factors to keep in mind when relating a game to your learning objectives:

- Cognitive objectives: Factual knowledge can be readily learned through frame games (e.g., question-and-answer-based Jeopardy, or a Concentration-style matching game) or through solving puzzles (possible with external searching for information) as part of quest games. Simulations or adventure games can require factual knowledge to solve problems or make decisions; procedural and strategic knowledge related to system interactions, as well as problem-solving skills, can also be major simulation game outcomes. In these situations it is important to see that simulation models are realistic and match (or do not conflict with) your objectives in using the game.
- Affective objectives: Games are often promoted as vehicles for changing attitudes and beliefs, e.g., when used to teach the importance of diet management for diabetes. How appropriate are the attitudes and beliefs embedded in a game? How appropriate are the implied social attitudes and beliefs, e.g., about violence, gender, race? What attitudes, beliefs, and actions are rewarded?
- Skill-based objectives: If your objectives include technical or psychomotor skills (e.g., typing, driving, flying, equipment disassembly and repair), it will be important for you to review any evidence available about how well the skills taught in the game transfer to the real world.
- Role within the larger learning context: A game is only one activity in the total learning system. How the game activity is assigned, supported, and debriefed is extremely important in making sure that its full learning potential is realized. Two key ways in which you as an educator can improve the success of your games are through collaboration and reflection.

Finding ways to make game play a collaborative rather than an individual activity adds the impetus of collaborative learning to the activity. In our experience, even simple traditional games such as question-based Tic Tac Toe can become lively shouting matches when teams compete to win. Collaborating on designing a city or roller coaster can lead a group to find and share ideas and knowledge far beyond the capabilities of one individual. Playing an MMOG leads a learner to collaborate spontaneously with others in order to progress in the game (Galarneau, 2005).

Many experts note the importance of reflection— encouraging students to think deeply about, and articulate, the learning that they experience in playing a game. Gee (2003) states the importance of incorporating active and critical thinking about how the learning relates to other semiotic domains. Commercial learning games, particularly for the K–12 age group, are beginning to appear with support materials to help teachers position and facilitate their use and to guide learners in reflecting on what they have learned and how it can be applied outside the game. For an example, see www.gamesparentteachers.com.

Technology Support

As with other learning technologies, technical infrastructure and support can make or break a game-based learning exercise. For an effective experience with your learners, you will need:

- computer and network configurations to support your play plan (individual PCs or handhelds for all, for small groups, or at the front of the classroom; if networked, stable online access with good response times;
- readily available technical support staff if something goes wrong;
- knowledge and experience with the game to answer questions and help learners who run into problems;
- clear navigation and help in the game software; and
- good security (e.g., anti-hacker and privacy guards, particularly when games are used with young children online).

Example 5.2.5.1

Effective learning games do not always need long story lines or sophisticated virtual worlds. Education Games Central games (www.savie.qc.ca/carrefourjeux /an/accueil.htm) routinely engage teams of young or older players in spirited competition in many content areas.

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5.2.6: Getting Started

At this time, games for learning (other than management simulations) are being tested in many interesting examples, but it isn't clear how widely they are being used. Often educators and trainers face obstacles to using computer-based games, including:

- lack of experience and long learning curves;
- time and costs required for custom game development and implementation;
- poor technology support for classroom-based game use; and
- institutional constraints (learning objective mismatches, standardized fact-based testing, class time constraints, lack of peer acceptance, etc.).

Prensky (2006) notes that curriculum requirements, especially when mandated through legislation, can pose a major obstacle, although "curricular" games are starting to be produced commercially. To overcome this and other obstacles, he suggests the following approaches to beginning to use games in class that ease games into your learning situation without major course restructuring:

- Bring games played outside class into the classroom through questions, discussions, etc. This can encourage students to reflect on how a game is relevant to a topic and what they are learning from the game. Make game play an assignment for individuals or small groups.
- Use the principles behind good, complex games to make some or all of your teaching more game-like, and therefore more interesting and engaging to students. One of Prensky's suggestions for keeping students engaged is to have them vote each time you ask a question.
- Play a game specifically designed for education in class, such as one of the examples cited above. To do this, you need to become quite familiar with the game in order to handle questions and technical problems.
- Play a commercial, off-the-shelf game not specifically designed for education, in class, either as a whole class (projected in the front) or as individual students playing separately. Have a student present the game, play the game yourself in front of the class as a springboard to discussion, or divide the students into small groups.

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5.2.7: Creating Your Own Game

If you decide to go beyond these options to create your own game, here are some possible approaches:

- Use a frame game: Frame games, such as the Educational Games Central ones described above, lend themselves to use, even for complex subjects, without a long learning curve if you can structure your learning in a question-and-answer format. To give an example, the EGC Snakes and Ladders frame game has been used to reinforce introductory social psychology concepts.
- Do a COTS game modification: Some commercial games, especially first-person shooters, real-time strategy games, and MMOGs, provide toolkits that let you create “mods” including your own graphics, game scenarios and characters. In one example, the MIT Education Arcade project “modded” the game NeverWinterNights, which comes with the Aurora Toolset game-editing tool, to create the Revolution game (http://www.educationarcade.org/revolution) to teach about the American Revolution seen from Colonial Williamsburg. Another mod of NeverWinterNights, Project BTM, was developed at the University of Minnesota to teach information-gathering stages to journalism students (Paul et al., 2005).
- Get help to custom-build a learning game: Many universities and technical schools have game studies programs with students who are looking for projects or work designing and building games using current tools and techniques. You may also be able to find funding for research or learning object development. For example, computer science students at Dalhousie University are working with physicians to build handheld and cell phone game prototypes to help local children learn about and manage chronic diseases (Watters et al., 2006).
- Create a blended game with computer support: If building a full-scale computer-based game seems too daunting, you can consider a game that uses computers or handhelds to support a game that also involves offline activities. The MobileGame, for instance, uses task instructions and clues delivered by cell phone to run an orientation game introducing new students to a university campus (Schwabe and Göth, 2005).

Note

Match your first project with your experience, learner characteristics, and available technology, technology support, and development resources. To build institutional support, aim for early successes before embarking on a large, longer-term project.

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5.2.8: Summary

> “Our students have changed radically. Today’s students are not the people our educational system was designed to teach … Our Digital Immigrant instructors … are struggling to teach a population that speaks an entirely new language”. – Prensky (2001b)

In the spirit of introducing the new language of games for learning, this chapter has reviewed basic terms, the motivation to use games for learning, examples to fire your own imagination, factors that make learning games effective, and guidelines for getting started successfully. We hope that this brief introduction has sparked your ideas and your desire to learn more about using computer-based games for learning in your context. Our references and the websites listed in this chapter are a good place to start, and your own searches will provide you with more information. We wish you great success as you explore this intriguing and promising area!

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CHAPTER OVERVIEW

6: Module 06- Google and Cloud Computing for Classrooms

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6.1.2: Identify The Instructional Goal(s)

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6.1.1: Introduction

Learning outcomes

- Describe each step of the instructional design process.
- Assess needs.
- Analyze goals.
- Identify subordinate skills.
- Conduct a learner analysis.
- Write complete learning outcomes at the highest appropriate level.
- Create courseware using the instructional design process.

Instructional design is a systematic, repetitive process of activities aimed at creating a solution for an instructional problem. In this chapter we describe the instructional design process, and provide details and practical guidelines for completing the process. You will also learn how to conduct a needs assessment and a learner analysis. This chapter also introduces a revised Bloom's taxonomy (Anderson & Krathwohl, 2001).

The steps in the instructional design process are shown in Figure 10.1. These steps, which are similar to other models, are adapted from Dick and Carey's (1990) model. Note that this chapter only covers the steps through to "Write learning outcomes". The subsequent steps, shown in Figure 10.1, are covered in other chapters of this book.

One danger in the instructional design process is that it can go on forever. Each step is a checkpoint, and must be signed off with the general knowledge that the results are acceptable enough to continue in the project. However, subsequent evaluation feedback may indicate a need to make changes in previously signed-off steps. These changes are sometimes the result of not putting the necessary time and resources into each step the first time.

This model represents an ideal situation. However, cost and time constraints will sometimes force you to make modifications. How safe such modifications as omitting or minimizing steps are will depend on the actual problem being solved, the information that is available, and your intuition or experience.

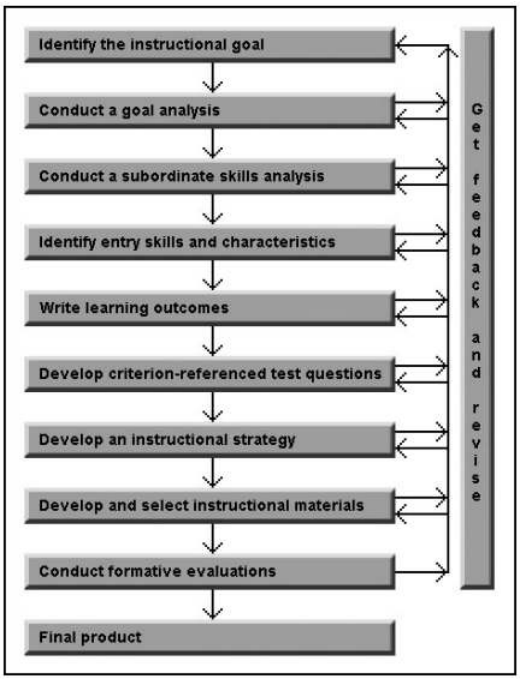


Figure 6.1.1.1: Steps in the instructional design process

For some courses, the systematic instructional design process can take hundreds of hours of development time. Factors such as the course's complexity, the course management system used, the availability of resources such as instructor notes, the team members' experience, team dynamics, and whether suitable design specifications exist, can all affect how much time is required.

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6.1.2: Identify The Instructional Goal(s)

Instructional goals are general learning outcomes that break down into specific measurable skills, for instance, learning to speak conversational French. Before identifying the instructional goal, you must first define the actual problem. You can gather the information for defining the problem and identifying the instructional goal through a needs assessment.

A needs assessment is a method for determining the actual problem, rather than the symptoms of a problem. For example, an individual may refuse to use the computer system because the “program doesn’t work”. In this case, the symptom (refusing to use the computer) may be hiding the real problem, which might be a fear of the technology, or of change.

A needs assessment is a valuable tool for:

- gathering information;
- understanding potential users;
- consulting users; and
- ensuring involvement, ownership, and fewer surprises for all affected individuals.

> **Note**
>
> Be sure that you define the real problem rather than a symptom of the problem.

Needs Assessment Tools and Techniques

Needs assessment tools and techniques include interviews, observations, surveys, group meetings, and a review of any existing documentation. You will need to decide on the best way to get accurate information, given limitations such as time and money. While conducting the needs assessment, avoid letting preconceived ideas, one particular idea, or too many ideas overly influence the problem definition or any step in the instructional design process.

Interviews

During interviews, consider asking people to:

- share problems they have experienced;
- rank a list of skills that can make them more effective;
- describe feelings or impressions pertaining to certain skills; and
- identify the best solution to a problem.

Phone interviews can be convenient, though person-to-person interviews are often preferred because body language can provide critical information. It takes skill to determine the truth, as Robert Orben noted: “Smart is when you believe half of what you hear. Brilliant is when you know which half.”

Observations

When making observations, ask people to demonstrate particular tasks. A task analysis, or complete step-by-step breakdown of the duties needed to perform a task, can provide important information about what actually happens. Watch for problems caused by inefficiencies. Determine the difference between actual and optimal performances. Be careful of the halo effect in which people behave differently because they are being observed. Determine what you can do when people do not want to be observed. Another observation technique is to analyze work products. Defects can show where problems occur in the process.

Note that existing reports, records, and statistics often contain relevant information.

Surveys

Surveys can be more effective if the survey is based on earlier observations, which might provide useful information about what questions to ask. In the survey, try to determine feelings. Attitudes can play a major role in job performance. Consider whether the provided information will be accurate. Will everyone fill out the survey honestly? Provide incentives to encourage participants to complete the surveys.

Group meetings

Group meetings can be an economical way to gather information. Before the meeting begins, carefully plan how you expect the meeting to proceed, but be flexible enough to allow the meeting to flow in other useful directions. Note that it is important to

prevent discord between group members, and to prevent one or two individuals from influencing the group unduly.

Reviewing existing documentation

Existing documentation could provide a list of existing goals or even reveal that the problem is already documented. It may state that there is a requirement for new instruction (e.g., learning how to use or repair new equipment or technology) or that there is a new mandate that requires an instructional solution. Documentation can be problematic if the goals and learning outcomes are non-existent or vague, there are contradictions between what is asked for and what is needed, or goals and learning outcomes shift.

Needs Assessment Results

Most importantly, your needs assessment should result in a precise definition of the problem. There should be a clear distinction between “what is” and “what should be”. Be sure that the real problem has been identified, rather than a symptom of the problem.

Sometimes the problem can be linked to:

- environmental issues, or technical problems such as worn or outdated equipment;
- lack of motivation, including low morale;
- poor incentives that can range from lack of recognition to undesired consequences such as extra work, or responsibilities, or an unwanted transfer; • communication weaknesses;
- illiteracy or lack of knowledge; or
- a combination of these problems.

Remember that a simple approach such as a job aid, perhaps a checklist, a print-based package, or a trainer hired for a short time, may be the most reasonable solution.

> **Note**
>
> Remember that many problems can be solved with simple solutions.

A needs assessment can also result in a statement of:

- the difference between wants and needs;
- the range of skills and knowledge that are available, and the range needed;
- how to bridge the gap between optimal workers and the less-accomplished workers;
- individual opinions and feelings;
- any factors that can interfere with learning;
- potential solutions for problems; and
- ideas for meaningful examples, cases, problems, and questions for use in the instructional solution.

Any resulting clearly defined instructional goal(s) should be:

- cost-effective;
- reached by consensus; and
- achievable with respect to time and resources.

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6.1.3: Conduct A Goal Analysis

A goal analysis results in a visual statement of what the learner will be able to do. Consider the goal of a learner who wants to learn how to film with a camcorder. Figure 10.2 illustrates how this general goal can be broken down into specific learner requirements.

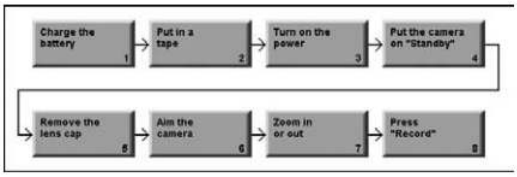


Figure 6.1.3.1: Goal analysis for operating a camcorder

To analyze a goal, describe in detail the consecutive steps the learner will complete to achieve the goal. As a rule of thumb the task should involve five to 15 steps. If there are more than 15 steps, the goal is either too big or the steps are too detailed. Some of these steps may be intangible, such as making an estimate of materials needed. Some steps may require a decision that results in two or more alternate paths. Focus on what learners need to do or perform, rather than what learners need to know.

Goal analysis includes classifying the goal into the domain, or kind of learning that will occur. The domains can be verbal information where learners state, list, describe, name, etc., intellectual skills such as learning how to discriminate, identify, classify, demonstrate, generate, originate, create, etc., psychomotor skills where learners make, draw, adjust, assemble, etc., and attitudes such as making choices or decisions [see Fenrich (2005) for details on these domain classifications]. Establishing the domain is important in determining what instructional strategies to use in subsequent steps.

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6.1.4: Conduct A Subordinate Skills Analysis

The sequential steps derived in the goal analysis are often too large to be taught in one step. The learner might need more information prior to learning a step. This can be seen in step 7 in Figure 10.3.1, where the learner needs some information about zooming in or out. Consequently, you need to break the steps into smaller components, using a subordinate skills analysis. When identifying subordinate skills, ensure the components are not too numerous, which can bore learners and interfere with learning, or too few, which can make the instruction ineffective. For each learning domain classification, you need to conduct a different type of subordinate skills analysis.

Verbal Information

With verbal information, you should derive the subordinate skills through a cluster analysis. In conducting a cluster analysis, identify all of the information that is needed to achieve the goal. After you gather the information, organize the information into logical groupings. Logical groupings should have up to five pieces of information for weaker or younger learners, or up to seven pieces of information for brighter or older learners. A few people can handle nine pieces of information but it is risky to assume that all learners in the target audience can do this. Humans can only process a limited amount of information at a time. These limitations must be factored into the design. To be safe, whenever there is doubt, choose smaller groupings.

Although some people think that verbal information is trivial, it provides the knowledge base for higher-level skills.

Note

Organize the information into small enough chunks for the learners to successfully learn.

Given the learning outcome “learners will be able to name body parts,” the verbal knowledge can be organized as illustrated in Table 6.1.4.1

Table 6.1.4.1:Organization of verbal knowledge for teaching body parts

Body area	Major parts	Smaller parts
Head	Eyes	
	Ears	
	Nose	
	Mouth	Lips, teeth, tongue
Torso	Shoulder	
	Chest	
	Abdomen	Belly button
Arm	Upper arm	
	Elbow	
	Forearm	
	Wrist	
	Hand	Palm, thumb, fingers
Leg	Thigh	
	Knee	
	Shin	
	Ankle	
	Foot	Heel, toes

Intellectual Skills

With respect to intellectual skills, you need to conduct a hierarchical analysis to determine the subordinate skills. An example of the skills needed to multiply three digit numbers is shown in Figure 6.1.4.1.

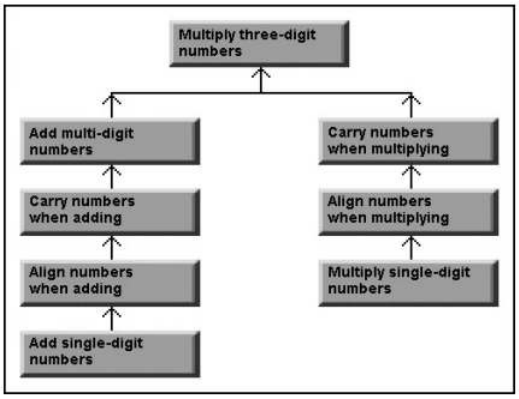


Figure 6.1.4.1: Hierarchical analysis for three-digit multiplication

For a hierarchical analysis, follow these steps:

1. For each goal analysis ask, “What must the learner know before learning this skill?” This creates the first hierarchical level.
2. For each first level component, ask the same question. This creates a second hierarchical level.
3. Continue this process as needed.

Assuming a problem-solving goal, the first level might be composed of rules, the second level might be rules or concepts, the third level might be concepts or verbal information, etc. Each level can have a simpler or equally difficult skill underneath it. (See Fenrich (2005) for more information on rules and concepts.)

Psychomotor Skills

You can derive subordinate psychomotor skills through a procedural analysis. An example of the subordinate skills needed for charging a battery for a camcorder is shown in Figure 6.1.4.2.

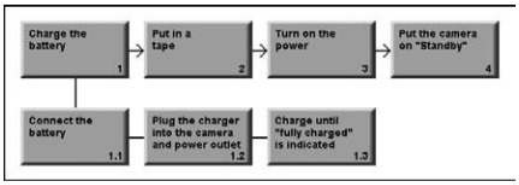


Figure 6.1.4.2: Procedural analysis for charging a camcorder battery

When conducting a procedural analysis:

1. Specify each activity that must be done for each goal analysis step.
2. Ask, “What must the student do or know before this step can be done?”
3. Continue this process as needed.

The resulting chart can include several layers.

Attitudes

To determine the subordinate attitude skills, you usually need to conduct at least one of the preceding instructional analysis techniques:

- For each goal analysis step, ask “What must the student do when showing this attitude?” The answer is usually a cognitive, intellectual, or psychomotor skill. With this information, you can do the appropriate analysis.
- Ask, “Why should learners show this attitude?” The answer is usually verbal information. You should then do a cluster analysis.

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6.1.5: Identify Entry Skills and Characteristics

For learning to be effective and to avoid frustrating learners, you must create a match or balance between the instruction and the learners' capabilities. The instruction must be designed for the target population, defined as the widest practical range of learners. Determine, as discussed below, the learners' abilities, language level, motivation, interests, and other relevant factors. You can obtain this information by interviewing teachers and learners, testing learners, and reviewing existing documentation such as test scores. The result should determine the entry or basic skills that the target population learners have mastered before the instruction begins. In other words, these preliminary skills will not be taught. In this step, you may also discover other factors that may influence the instructional design.

Note

Create a balance between learner capabilities and the instruction.

Based on the completed instructional skills analysis, draw a dashed line just below the skills that most, if not all, of the target population possess (Figure 6.1.5.1). You will teach the skills above the dashed line, and not those below the dashed line. In the example here, learners will not be taught how to add multi-digit numbers, any skill below that, or how to multiply single-digit numbers. It is assumed that target audience learners will have these skills.

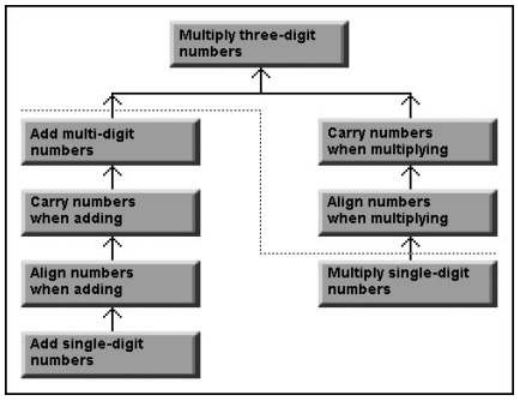


Figure 6.1.5.1: Entry skills

You should confirm this decision by asking the subject-matter experts whether the entry skills should be tested within your lesson. If there is any doubt about whether the target audience learners possess the skills, pre-test for those skills. You can do this on paper, by computer, or in any format that provides accurate data. The instructional design process later includes testing the instruction with learners who are truly representative of the target audience population to ensure that the entry-level behaviours are set appropriately.

Learner Analysis

To adapt your instructional design to the needs of your target population, you should ask questions that elicit information about the learners' abilities, language skills, motivation, and interests. Conducting a learner analysis will also let you define your population precisely

If possible, you should observe typical learners., This can help in selecting relevant and meaningful examples, choosing appropriate role models, and avoiding inappropriate stereotyping.

Note

To ensure your materials are aimed at the correct student population, consider the learners' abilities, language capabilities, motivation, interests, and human factors.

Abilities

You should ask the following questions about the learner's abilities:

- What are the current skill levels?

– Sometimes, a learner's prior knowledge and experience can interfere with the new learning. For example, the menu items in an old software package may be different from those used in the new version of the software. These differences can be addressed in the instructional materials. – Are all of the learners computer literate? To what degree? What guidance will they need?

- What are the learners' mental capabilities?

  – Are they fast or slow learners? – How well can they memorize information? – Will learners be able to choose appropriate learning paths? How will they be guided?

- What are their confidence levels?

  – This information can be used to determine the size of the incremental learning steps.

- What are the learners' maturity levels?

  – Are they independent or do you need to closely monitor their work and progress?

- Are there any learner misconceptions?

  – Ensure that you address all misconceptions.

- Will learners prefer to work alone, in pairs, or in groups?

  – Provide activities for each preference. for variety, and to ensure that learners can work in the way they prefer some of the time.

Language capabilities

You should ask the following questions about the learner's language capabilities:

- What are the learners' language levels?
- What specialized vocabulary do the learners already know?
- Is their preferred language style conversational, scholarly, or technical?
- Should the material be taught in one, two, or more languages?
- Will an audio narration be needed for learners who have weak reading skills but good oral comprehension?

Motivation and interests

You should ask the following questions about the learner's motivation and interests:

- Why should the learners learn the material?

  – What would make the material particularly relevant and meaningful?

  – Are there any attitudinal or motivational problems? If so, how can these problems be overcome?

- What are the learners' background experiences?
- What will the learners find interesting?
- Are learners learning the material because they are required to learn it, or because they want to learn it?
- Are there any learner preferences for specific media?

  – Remember that learning effectiveness is a primary concern.

  – Will learners be easily de-motivated with certain media? For example, do learners presume that materials with a large text component are boring?

  – Are there past failures associated with a particular medium?

- How should testing be done?

  – Are certain test formats preferred over others? For example, would short-answer questions deter learners who have poor keyboarding skills?

  – Should testing be formal or informal?

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6.1.6: Write Learning Outcomes

Learning outcomes or objectives are specific measurable skills and are more specific than instructional goals. For example, if a goal is to be able to speak conversational English, a learning outcome could be to conjugate the verb “to be”. Learning outcomes communicate to learners, instructors, and other interested people, what the learners should be able to do, compared to their current skill level. Success occurs when learners achieve the planned outcomes. Learning outcomes help learners organize their studying, avoid becoming lost, make appropriate decisions such as whether to study a section or not, and maintain their motivation. If you inform your learners of the learning outcomes, they will, on average, attain slightly but significantly higher results. Even though some learners do not read learning outcomes, include them for those who do want and need them.

It is critical for you to define specific learning outcomes since they form the basis of the subsequent instructional development process. Accurate, well-written learning outcomes can save development time and money by helping to keep the process on track. Without specific learning outcomes, it is easy to start branching off on interesting tangents, which could make it impossible to finish a project within the constraints given. Whenever you have doubt about whether some material should be included, you can refer to the stated learning outcomes.

Many projects have failed because of poorly written or non-existent learning outcomes. Check all learning outcomes for flaws. If a learning outcome is not specific and measurable, do not proceed with further design and development. Even when you define the learning outcomes, there is no guarantee that you will successfully teach them. In order to ensure that learning takes place, you still need to follow the subsequent instructional design steps.

Note

Well-written learning outcomes help keep the subsequent instructional development process on track.

Steps to Writing Learning Outcomes

There are five steps to writing learning outcomes. For each step, think about why each example is good or poor.

1. Once you have decided on a content area, use action verbs to identify specific behaviours. The verb should be an observable behaviour that produces measurable results. The verb should also be at the highest skill level that the learner would be required to perform. We’ll discuss the revised Bloom’s Taxonomy, which will give you details about the different skill levels, in the next section. Note that learners often need a knowledge base of lower-level skills in order to succeed at higher-level skills. Based on your previous entry skills decisions, you might have to teach the lower-level skills.

    Good: calculate, compute

    Poor: understand, know.

2. Specify the content area after the verb.

    Good: Calculate averages and compute variances.

    Poor: Calculate statistical information and compute values needed in economics.

3. Specify applicable conditions. Identify any tools to be used, information to be supplied, or other constraints …

    Good: Given a calculator, calculate the average of a list of numbers. Given a spreadsheet package, compute variances from a list of numbers.

    Poor: Given an available tool, calculate the average of a list of numbers.

4. Specify applicable criteria. Identify any desired levels of speed, accuracy, quality, quantity …

    Good: Given a calculator, calculate averages from a list of numbers correctly 100 percent of the time. Given a spreadsheet package, compute variances from a list of numbers rounded to the second decimal point.

    Poor: Given a calculator, calculate averages from a list of numbers correctly most of the time.

5. Review each learning outcome to be sure it is complete, clear, and concise. Get content experts and learners to review them, and get approval before continuing.

Perhaps the worst example of a learning outcome ever written is:

The learner will understand and appreciate the learning outcomes of the course.

Revised Bloom's Taxonomy

Bloom et al. (1956) classified learning outcomes into six taxonomies:

1. Knowledge
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

This has been an invaluable resource that has helped numerous educators design instructional materials to the appropriate skill and thinking levels needed. Relatively recently, Anderson & Krathwohl (2001) revised Bloom's taxonomy into these hierarchical categories:

1. Remember
2. Understand
3. Apply
4. Analyze
5. Evaluate
6. Create

Your subsequent instructional strategies, questions, other interactions, and tests should relate to the appropriate skill and thinking levels, which directly correspond to the stated learning outcomes. Remember that each of these six categories can contain verbal information, intellectual skills, and attitudes.

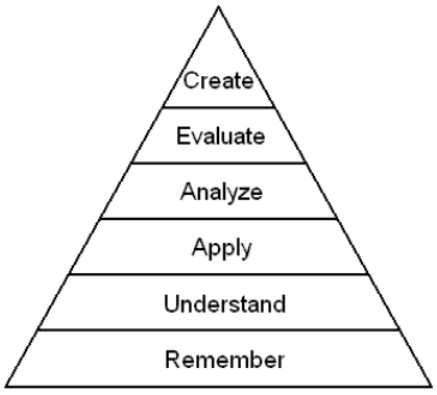


Figure 6.1.6.1: Revised Bloom's Taxonomy

Remember

Remembering skills entails recalling information as it was presented.

Sample verbs: State, describe, label, list, name

Example: List the different types of media that online courses can include.

Understand

Understanding skills can include restating knowledge learned earlier in one's own terms, translating ideas and concepts, and recognizing inferences and assumptions. Understanding skills can be tested by repeating questions and problems in a different form.

Sample verbs: Convert, estimate, explain, summarize, locate

Example: Explain why online courses should not necessarily include all types of media.

Apply

When applying skills, learners apply knowledge to new situations. Learners must decide how to solve the problem. For application skills, you can use fictional situations, material learners have not seen, or modify old problems.

Sample verbs: Relate, compute, change, apply, use

Example: Using Bloom's taxonomy, write complete learning outcomes at the appropriate level.

Analysis

Analysis breaks down existing knowledge into meaningful parts. Analysis can require learners to detect relationships and draw conclusions. You can use experiments or supply data to test analysis skills.

Sample verbs: Break down, differentiate, determine, relate, analyze

Example: Given a properly written learning outcome, identify the learning outcome's conditions, skill, and criteria.

Evaluate

Evaluation entails using personal values to judge knowledge. Evaluations are hard to grade objectively.

Sample verbs: Appraise, compare, conclude, criticize, assess, evaluate

Example: Evaluate the effectiveness of an online course.

Create

To create is to produce something new, or to modify a thing that already exists. Creating can also take the form of a speech, proposal, project, or theory.

Sample verbs: Summarize, revise, compose, construct, create, synthesize

Example: Create an online course that includes all of the instructional events.

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6.1.7: Summary

Instructional design is the systematic process of activities that solve an instructional problem by identifying the instructional goal, conducting a goal analysis, conducting a subordinate skills analysis, identifying entry skills and characteristics, and writing learning outcomes.

An instructional goal is broad learning outcome that can be broken down into specific measurable skills. To identify the instructional goal, you must first define the actual problem through conducting a needs assessment.

Once you have determined the instructional goal, the goal is refined through a goal analysis. This will lead to a statement of what the learner will be able to do. The emphasis is on what learners need to be able to do, rather than on what learners need to know.

The goal analysis is refined into smaller components through a subordinate skills analysis. The subordinate skills analysis ensures that each component is small enough to teach, and shows what information a learner needs prior to learning each component. Verbal information, intellectual skills, psychomotor skills, and attitudes each need a different type of subordinate skills analysis.

With verbal information, conduct a cluster analysis in which you have identified all of the information needed to achieve the goal, to determine the subordinate skills. After identifying the information, organize the information into logical groupings of up to five pieces of information for weaker or younger learners or seven pieces of information for brighter or older learners. Verbal information is important in that it can form the needed knowledge base for higher-level skills.

For intellectual skills, conduct a hierarchical analysis to determine the subordinate skills:

- For each goal analysis step, ask “What must the student know before this skill can be learned?” This creates the first hierarchical level.
- For each first level component, ask the same question. This creates a second hierarchical level.
- Continue this as far as needed.

Subordinate psychomotor skills can be derived through a procedural analysis:

- Specify each activity that must be done for each goal analysis step.
- Ask, “What must the student do or know before this step can be done?”
- Continue this as far as needed.

To determine the subordinate attitude skills, conduct at least one of the following instructional analysis techniques:

- For each goal analysis step, ask “What must the student do when showing this attitude?” The answer is usually a cognitive, intellectual, or psychomotor skill. With this information, you can do the appropriate analysis.
- Ask, “Why should learners show this attitude?” The answer is usually verbal information. You should then do a cluster analysis.

For learning to be effective, and to avoid frustration, the instruction and the learners’ capabilities must match. Design the instruction for the target population, defined as the widest practical range of learners. Determine the learners’ abilities, language level, motivation, interests, and human factors. The end result should determine the entry or basic skills that they must have before the instruction begins.

Learning outcomes, or objectives, are specific, measurable skills that communicate to learners, instructors, and other interested people, what the learners should be able to do after completing the learning. Success occurs when learners achieve the planned outcomes. Learning outcomes form the basis of the subsequent instructional development process.

To write learning outcomes:

1. Identify specific behaviours through action verbs. The verb needs to be stated at the highest skill and thinking level that the student will need to do. Use the revised Bloom’s taxonomy as a foundation for selecting verbs.
2. Specify the content area after the verb.
3. Specify applicable conditions. Identify any tools to be used, information to be supplied, constraints, etc.
4. Specify applicable criteria. Identify any desired levels of speed, accuracy, quality, quantity, etc.
5. Review each learning outcome to be sure it is complete, clear, and concise.

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CHAPTER OVERVIEW

7: Module 07- Copyright and Organizing Digital Information

7.1: Understanding Copyright - Knowing Your Rights and Knowing When You’re Right

7.1.1: Introduction

7.1.2: A Brief History of Copyright

7.1.3: Anatomy of Copyright

7.1.4: What Copyright Does Not Protect

7.1.5: Exploitation of A Work

7.1.6: Copyright in Higher Education

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7.2: ‘Open Licences’ of Copyright for Authors, Educators, and Librarians

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7.2.2: Software Open Licences

7.2.3: Open Licences for Non-Software Material

7.2.4: Access to Knowledge and Information Sharing

7.2.5: Concluding Comments

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SECTION OVERVIEW

7.1: Understanding Copyright - Knowing Your Rights and Knowing When You're Right

7.1.1: Introduction

7.1.2: A Brief History of Copyright

7.1.3: Anatomy of Copyright

7.1.4: What Copyright Does Not Protect

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7.1.7: Best Practices

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7.1.1: Introduction

Learning outcomes

- Define “ownership”, both as a concrete concept and as an abstraction, as a practical measure of property rights.
- Identify your rights as the owner of intellectual property
- Explain why seeking permission to use copyrighted material is preferable to using materials without permission.
- Identify some common instances of copyright infringement.

Copyright is a word that has developed its own mythology.

It is almost impossible to go through a day without coming into contact with something protected by copyright. Music on the radio as we commute into work, the architecture of the home we live in, or the buildings we drive by, articles in the newspaper—you could safely say that almost every item we touch or interact with has some ‘copyright’ factor associated with it. With such a proliferation throughout our economy it’s surprising just how often ‘copyright’ is misunderstood.

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7.1.2: A Brief History of Copyright

Early History

The concepts underlying copyright protection have been around for at least 1500 years. The situation before the sixth century is a little unclear. Copyright has always been a response to technological change. The first such change was the advent of writing itself. Before writing, history was recorded through stories that were told and retold to succeeding generations. In the oral tradition it would not have occurred to anyone to restrict who could repeat the tales.

The first documented copyright dispute occurred in sixth-century Ireland. This isn't a tale of high priced lawyers arguing over minute details of the law—rather it is a tale of religion, power and bloodshed. In the early part of the sixth century Columba of Iona, a priest, borrowed a psalter from Finnian, and then diligently copied it page by page, though without asking Finnian for permission to do this. Finnian demanded the return of the psalter, and appealed to the Irish king Dermot, who ordered the copy be handed over to Finnian. When Columba refused to comply, Dermot used military force to see his judgment through. In the end, as many as three thousand men may have died.

While this tale certainly has all the elements of modern day copyright piracy, with the addition of armed conflict, it was not until much later that copyright issues came to the fore. St. Columba had to copy the psalter by hand, a very slow laborious process. Since very few people were literate, copyright wasn't much of an issue. It was not until the invention of the printing press that the idea of granting permission to make copies has any significance.

First laws

With the printing press it became possible to make multiple copies of books efficiently. Books became a commodity. Printing and selling books was soon a lucrative venture. At first the system of controlling the right to make copies was ad hoc. Kings and other rulers would grant the privilege of printing books to one printer or another. Books that were not authorized were banned. Printers who produced unauthorized works were arrested. Printers held a monopoly on the titles they printed. This system was clearly aimed at aiding the printers, as opposed to the authors. It was also a system that was ripe for corruption. It has been argued that one of the causes of the English Civil War was the monopolies handed out to his friends by Charles I.

The Statute of Anne, enacted in 1710 by the British parliament, is regarded as the first copyright law. This law placed the right to authorize the reproduction of a book not in the King's hands, but in the author's. This exclusive right lasted for 21 years, after which time the book entered into the public domain, and anyone would be free to copy it. The state of affairs in copyright remained relatively calm for the next two centuries. Book publishing increased in importance, both in society and within the economies of the world's nations. While printing technology improved, the process of publishing, and the state of trade in creative works remained largely the same.

Other nations took very different tacks in regard to copyright law. The United States of America, for example, entrenched the fundamental elements of their copyright law in their constitution.

Twentieth-Century Development

While the 18th and 19th centuries were relatively stable in terms of copyright law, the 20th century saw a torrent of challenges, changes, and adaptations to the law. Technological change became a constant. Many of the technologies we take for granted today represented major challenges to the copyright status quo.

The invention of the photograph created a new, previously unimagined method of creativity, and generated an intense debate over the difference between a painting and a photograph. Was a photograph even a creative work? Was it not just a reproduction of that which already existed in nature, or was it analogous to a painter creating an impression of the same scene?

The ability to record musical performances opened a fresh can of copyright worms. For the first time there was an ability to 'fix' the performance, to store it and repeat the performance indefinitely. This raised questions about the rights of the composer, the performer, the recorder, and the distributor. For the first time, the idea of everybody owning a tiny slice of rights surfaced.

The idea of derivative rights was brought to us via the motion picture industry. This new form of expression was ripe for exploitation. The law was clear that one could not reproduce a novel or story in print, but what about adapting it into a movie? There was no law in this area, and so naturally the movie studios quickly delved into the libraries, adapting popular books for film. Book publishers of the day quickly moved to have the laws amended to block this loophole!

Other innovations included radio, television, and the photocopier. These minor challenges were essentially dealt with without legislative change to copyright law, as was one much more significant innovation.. The anticipated introduction, by Sony, of the home video tape recorder caused a great deal of consternation for television broadcasters. The VCR would allow the public to retain copies of their broadcasts for later viewing, or even sharing with friends and neighbours. Universal Studios sued Sony in an attempt to block the introduction of the VCR, and thankfully for everyone who has ever taped a television program for later viewing, they lost. The courts ruled that Universal Studios could not block the introduction of the VCR, which they acknowledged could be used to infringe copyright, because the device had significant non-copyright infringing uses. Had the VCR been intended only to reproduce copyright works it never would have seen the light of day as a consumer product. Today the sale or rental of movies for home viewing represents a major source of revenue for companies like Universal Studios.

All of these technological developments and adaptations of copyright law, either through the judiciary or through legislative change, were little more than a prelude to the challenges that arose in the late 20th century.

Contemporary Situation

At the beginning of the 21st century technological change has reached an amazing pace. New methods of communication, creation and transmission of ideas or works are introduced every day. New methods of exploiting creative works appear almost daily. Until recently, the technologies available to copy a work would not allow a perfect copy. A photocopy of a textbook is a poor substitute for the original, a tape made from a record is never as clear as one from the publisher. Now digital technologies allow for perfect (or near-perfect) copies—as many as are needed—to be transmitted around the world.

These technological innovations have re-opened the debates surrounding copyright protection. Given the ease of reproduction, some people have wondered about the relevance of copyright laws—proposing movement from a monetary economy to a gift economy, from competitive production to collaborative models. The open-source movement is a prime example of this debate. As a response to closed, proprietary software many software developers have moved to a model where the sharing is a requirement of distribution. Open source software licences permit the modification, distribution, and reproduction of the software without further permission or payment. The only requirement of these licences is that the same terms must be offered to any recipient of the code, and that the original source must be publicly accessible. Often described as an ‘anticopyright’ movement, the open-source licences are entirely reliant on the existing copyright laws.

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7.1.3: Anatomy of Copyright

Property And Ownership

Most people are familiar with the idea of ownership. We have all felt the pride of that first bicycle, or other prized childhood possession. But what exactly is ownership? This question has an easy answer: Ownership is the possession of property. This, of course, leads to the next question: What exactly is property? Again an easy answer comes to mind: Property is the stuff I own. There is no fundamental aspect that makes one object property, while another is not.

There is of course the idea of 'property' as a portion of land (real estate) which one person controls or possesses, probably the most important property we own. But of course the owner does not have complete control over his real estate. It is impossible to pick it up and move it to another location, and there are limits as to how the land may be used within any municipality.

Another form of property includes those items that can be moved, such as cars, computers, books, and pens. Ownership of a car is normally evidenced by registration of the title with some government agency, but what about the ownership of a pen? That form of ownership relies entirely on the mutual recognition of property rights. A pen is mine only because the other people in the room recognize it as my pen. Possession is 15/10ths of the law.

One of the key features of our modern society is the legal structure built up around the idea of property. Real estate is defined by law; my possession of a portion of land is granted by the government. Theft, fraud, trespass, vandalism are acts against property that have been forbidden by law. We accept these laws, largely without question, even when there may be valid reasons to refute them. Is someone who takes a loaf of bread from a store to keep from starving really a criminal? How about the person who paints anti-nuclear slogans on the side of a warship?

The laws relating to property have not been decreed by some dictator; rather, they have evolved to meet the needs of our society. Modern society has progressed from the time when possession of land was necessary for survival to a time when possessing tools for a trade could provide the income with which to buy the sustenance that land alone used to provide. Now we are in an age where most economic activity is cerebral—service and creative industries now dominate our economies. Similarly, laws have evolved that mirror this transition. During the last few centuries the concept of 'intellectual property' has been defined and developed.

A Simple View of Copyright

Copyright is the right to copy, period. Such a simple statement could lead you to believe that any time you copy anything, even a small part of something you are infringing copyright. If it is impossible to do anything without infringing copyright then how relevant is the law?

What Copyright Protects

Copyright applies to, and protects, creative works. This includes the written word in literature, artistic endeavours such as painting or photography, the performing arts, and the combinations of these works in areas such as film or television.

Under international treaty, there is no requirement that a work carry any notice of copyright to be protected. This was the case for American copyright up until the 11576 Copyright Act. Today copyright protection is automatic, and applies from the moment an idea is 'fixed' into a tangible medium.

Moral Rights

For an artist or author, reputation is everything. In most countries copyright law includes provisions to protect the reputation of the author or artist. Nothing may be done to a work that reduces the reputation of the creator. This could include actions such as editing a work to give it a different character, altering a work of art to change its meaning, or including a work in a context that harms the reputation of the author. Moral rights may be waived, but they cannot be sold or transferred. In some nations moral rights are perpetual. In other nations they match the term of copyright protection. In some places they cease to exist when the author dies. In the US, there is no formal recognition of moral rights.

Economic Rights

The main feature of copyright law is the commoditization of creative works. This is to say the creation of property-like rights in regard to creative works. Property is an often-misunderstood concept. Usually property refers to some physical, tangible object, which someone is said to own. My car, my pen—anything that begins with 'my' is usually considered a piece of property; that is,

things that belong to me. John Locke stated that people have natural right to own the fruits of their labours. Taking this further, who else could own the thoughts of an individual? Copyright law makes it possible for artists and authors to record their creative thoughts and sell, rent, or lend them. This is clearly an economic issue— how are creative people within society rewarded for their labour?

International Rights

Trade in cultural goods presents many interesting dilemmas. When a tangible product, such as a car, is traded between two nations, it is a simple matter. When a book is traded, it can become a very complicated transaction. Consider a situation where two nations do not recognize each other's copyright laws. In such a case if a single book is traded, it can then be reproduced by a publisher in the receiving nation and resold many thousands of times (assuming it is a good book). Of course the copyright owners may demand that no copies be traded with nations that do not recognize their rights, but enforcement of such a decree is next to impossible.

This situation was rectified in the late 19th century with the creation of the Berne Convention for the Protection of Literary and Artistic Works. This international treaty sets out basic conditions required in each member nation's copyright laws, as well as creating a system of international copyright law. The key concept under Berne is the idea of "national treatment". Under this term, a work is protected by the copyright laws of a given nation regardless of the nationality of its author. This means that an Australian author's works are protected by US copyright law in the US, just as an American author's works are protected by Australian copyright laws in Australia. This also means that a consumer of copyright works within a country need only understand the laws of their country. It is only when a project will be multi-national that the variations between copyright laws need to be examined.

Under the Berne convention, copyright protection must last for at least the life of the author plus fifty years. Copyright must apply to "every production in the literary, scientific, and artistic domain, whatever may be the mode or form of its expression" (Berne Convention 1886, Art. 2(1)). There must not be a formal process required for copyright protection, such as a requirement for a copyright notice. Currently 163 countries are members of the Berne convention, making it a nearuniversal treaty.

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7.1.4: What Copyright Does Not Protect

Copyright is not absolute. There are many situations where copyright protection is either nonexistent or limited. The exceptions and exclusions to copyright law are critical tenets of the law. Copyright is not a system of censorship. It is not intended as a tool to suppress debate or criticism. Unfortunately this principle has not always been adhered to.

Copyright is not intended as a system to confine or restrain culture, although certain groups have attempted to do just that. Copyright law attempts to grant rights to the authors and artists, while balancing the rights of readers, art lovers, and other creators.

To be protected by copyright a work must be significant, not in terms of its impact on society, but in proportion to the entire work. A small quotation is not likely to be protected by copyright, unless of course it is the kingpin in an entire work. There is a story circulating regarding a request for clarification on what constitutes a significant portion of a work made to a major publisher. The response came back that every word copied from one of the publisher's books should be cleared before being re-used. The question then is, what about the word "the"?

Facts

Copyright protects creative works; that is, it enables an author or artist to collect an income from their ideas. Facts have no author, or if they did, the author exercised no creativity. Facts are clearly not protected by copyright. But what if there is some form of creativity involved in the collection or presentation of those facts? In such a case the work in its entirety would be protected, but each underlying fact would still be unprotected.

Ideas

Copyright protects the expression of an idea, not the idea itself. For a work to be protected it must be "fixed", that is, recorded in some physical form. Many of Disney's movies have been based on public domain fairy tales. From Cinderella to Aladdin, Disney has used these public domain tales as the basis for feature length animated films. If copyright law protected both the expression and the idea underlying the expression, then Disney would now hold rights to these tales. While Disney does hold certain rights to their creations, those rights are limited only to the exact expression fixed in their movies. Without this critical aspect it would be impossible to maintain any balance between creators and the public.

Users for The "Public Good"

Most copyright legislation recognizes that certain uses of copyright material benefit society as a whole. Education is a classic example. The better educated a society is, the more well off its members can expect to be.

Criticism of a work or body is considered to be in the public good. It is considered beneficial to debate important issues; as well, it is often necessary to infringe the copyright of a person or persons to reveal their intentions to the public in general. The courts in many jurisdictions have recognized this and created jurisprudence that protects such uses. There are clauses in many copyright laws specifically stating that copying for the purpose of criticism is not a copyright infringement. Consider the difficulty in gaining permission from a copyright owner to use their work in a manner which will portray them in a negative manner. There have been cases where entire works have been reproduced, and the courts declared that no infringement occurred.

Challenges

It is unfortunate that most of these exemptions are not stated as a positive right; rather they are defensive in nature. The best legal arguments may protect you in court, but they do very little to protect you from being brought to court in the first place. Many times a person has copied protected work in a manner that is fair, and in the public good, however when faced with a lawsuit from the rights holder they are forced to concede, and cease their use of the material. It's not the person with the legal right who wins, it's the person wit the deepest pockets.

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7.1.5: Exploitation of A Work

One of the best ways of understanding copyright protection is to know how copyright works can be exploited; that is, used for financial gain by the copyright owner. Here's a list of all the ways to use a work:

- **Copying**: This is the oldest form of exploitation of a work protected by copyright! This is the arena of book publishers, music distributors and film houses. The issue is fairly clear if we are talking about an entire work. The grey areas appear when we start talking about copying part of a work. If the law states that no part of a work may be copied, then what happens to cliché's? What about small quotations needed to make a point? What is the line between acceptable copying and copyright infringement?
- **Adaptation or derivatives**: This is a right that emerged in the late 19th and early 20th centuries. This is the right to take a work and create a new work based on it. This is the home of 'film rights' and the like. Examples would include making a movie from a book, or a sculpture from a painting.
- **Translation**: At times foreign markets demand a book or other work, when the artist has no intention of supplying it in the chosen language. It is often difficult to directly translate a work into a new language. This can lead to moral rights issues, if the translator is unable to properly relay the author's original intent.
- **Performance**: In music, the choice of orchestra, the choice of arrangement even the choice of instruments can greatly affect the resulting performance. Consider the plethora of cover tunes—some good, some bad, some horrid. It is clearly in the composer's interest to be able to control how their works are performed. In many cases it is the only way a composer can gain an income from their work.
- **Broadcast**: The advent of radio created a challenge to copyright laws of the day, not unlike the challenge brought by Napster and online file sharing. There is a tendency to believe that when one hears a song on the radio, it is being heard for 'free'. This is not the case, as radio broadcasters carefully record each song played and remit payment to the copyright owners for each broadcast. Of course radio broadcasters cover this fee through the sale of advertising.

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7.1.6: Copyright in Higher Education

Unique Position of Educational Institutions

The university is unique as both a creator and a consumer of copyright works. Most people are unaware of the many fees and licences that exist for the use of copyright works.

Issues relating to the use of copyright materials in teaching and learning are not new, in fact most materials have been used for so long we simply forget the underlying scheme that exists to pay the copyright fees. Many forms of copyrighted works—books, music, video, and sculpture are used in the modern university. These works are brought in for a range of purposes—for the entire student body, for specific faculties and schools, or for a specific course offering. Fees for the use of these materials are paid for by university departments, including the library, the faculties and schools, and by individual students. Table below demonstrates the matrix that describes this situation.

	Individual Student	**University Department**	**Faculty or School**
Books	Bookstore— assigned texts For a given class. Brought in by the bookstore and resold to students. Goal is cost recovery.	Library—the library selects titles appropriate for the entire student body.	Library—certain library purchases may be made at the request of a specific school. While these books are available to the entire student body, they are of primary interest to that one school
Journal subscriptions		Library—the library selects titles appropriate for the entire student body.	Library—certain library purchases may be made at the request of a specific school While these books are available to the entire student body, they are of primary interest to that one school
Photocopies	Purchased by individual students, at self serve copiers. Paid for via cost recovery (machines) and Access copyright licence. Also supplied by the university bookstore/ reprographics on cost recovery basis.		Distributed to students in class, cost borne by department. Covered by Access copyright licence
Digital Assets	Included on CD/companion website, Cost borne by the student		

Exemptions and Their Impact

Fair use, fair dealing and other exemptions are defenses in court, nothing more. This means that even with a solid argument for fair use, the copyright owner is still able to sue the user. Often the initial press regarding the case represents the greatest cost to the right's user, damaging their reputation and setting other rights holders' guards up against them. Add to this the cost of mounting a defense against such claims of infringement, and it is easy to see why most claims of copyright infringement are dealt with quickly and quietly.

Student Right

Often students are unaware of their rights. They produce essays and term papers for submission to their instructors and then forget about them. The question of copyright is never considered. Most teachers know that examples of past work, both good and bad, can

be an excellent aid to the learning process for current students. Presenting past student work is only legal if permission has been secured. This is easily done with a simple submission form where the submitting student can tick off what rights they are willing to grant the instructor or the school.

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7.1.7: Best Practices

Know the Law

There are two problems that occur when instructors are not familiar with copyright law. The first, and most worrisome for administrators is the infringement of copyright. When third-party materials are used without proper regard to copyright law, the institution is exposed to a serious liability. The damage from a copyright infringement case would not only be economic, as the institution would have to pay for a defense, but also the reputation of the institution would be damaged. The second problem occurs when instructors fail to use materials that would enrich the learning experience of their students simply because they believe copyright law prohibits such use, or that obtaining permission would be too onerous. This does a disservice to the students as well as to the authors and artists of our society.

Plan for the Unexpected

Even in the best of circumstances things can go wrong. It is possible that a copyright owner may be unavailable to grant permission for some reason, or there may be reasons that prevent the author from granting permission, or you may run into a copyright owner who is simply not going to grant permission. Having a back-up to replace any work will be a huge benefit.

Documentation

When using third-party material, keep careful records of where content came from, what steps have been taken to obtain permission and under what terms permission was granted. At a minimum, any correspondence with copyright owners, including any final licences, should be retained for as long as a work is used. It is also good idea to retain a record of research undertaken while trying to determine who owns the copyright.

Consider the Benefits

One of the side effects of seeking permission to use materials is the creation of a dialogue between creator and consumer of a work. Often, academic authors are only interested in how their works are used. By seeking permission you may also obtain access to unpublished materials, or higher quality copies. If there are any difficulties regarding the use of materials, if you have permission to use them you can go back to the rights holder for assistance. Imagine trying to do this for a ‘bootleg’ copy.

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SECTION OVERVIEW

7.2: ‘Open Licences’ of Copyright for Authors, Educators, and Librarians

7.2.1: Introduction

7.2.2: Software Open Licences

7.2.3: Open Licences for Non-Software Material

7.2.4: Access to Knowledge and Information Sharing

7.2.5: Concluding Comments

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7.2.1: Introduction

Learning outcomes

- Understand what open licence software is about and start looking for an appropriate licence for software you are developing;
- Appreciate the advantages and disadvantages of using open licence software;
- Understand how open licensing for non-software educational material works;
- Appreciate the access to knowledge movement and what it aims to achieve.

An open licence, as used in this chapter, is a neutral expression for a licence granted by someone who holds copyright in material allowing anyone to use the material subject to the conditions in the licence but without having to pay a royalty or licence fee.

There are many different open licences, some for computer software and some for other forms of material. Each has its own terms, conditions and vocabulary. This chapter is an introduction to open licence language and to the open licences that are important for authors and educators. It is not legal advice. Individuals or institutions thinking of committing themselves to open licensing should get professional legal advice about the implications of the licences they are considering using.

Supporters of the different licences do not always agree with one another. There are even extremists who, disliking the business practices of some commercial software suppliers and publishing houses, want to use open licences to do away with restrictions on using copyright material. Despite the understandable wish of some open licence supporters to reform copyright law, open licences are legal tools that use the existing copyright law. They rely, in particular, on the exclusive right copyright law gives a copyright holder to licence material with an open licence or any other form of licence.

The chapter starts by looking at software open licences. Software developers working on open licence software will need a more detailed explanation of the different open licences than they will find in this chapter. But even authors and educators with no pretensions to ICT expertise depend on operating systems, word processors, communication packages and online learning software. This part of the chapter aims at providing such users with an introduction to open licence software and its advantages and disadvantages.

Understanding software open licences is also a good introduction to the open licences that apply to other materials and, in particular to Open Educational Resources (OERs). The second part of the chapter looks at these open licences and, in particular, at the Creative Commons licences. The chapter ends by looking briefly at the Access to Knowledge (A2K) movement that aims at making all forms of information more freely available.

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7.2.2: Software Open Licences

The Hacker Culture

Open software licenses had their origins in what Eric Raymond calls the hacker culture. (Eric Steven Raymond How to Become a Hacker 2001, latest revision 2007, http://www.catb.org/~esr/faqs/hacker-howto.html). For Raymond and those who work with open license software “hacker” has its original meaning of a committed software developer. It does not refer to a criminal who breaches computer security. Hackers share their discoveries and feel free to use the work of other hackers. This leaves hackers free to work on unsolved problems rather than waste creative energy repeating what others have done. Hackers who publish their work, either on the Internet or in other ways, have copyright in it. At first, however, few hackers bothered with copyright. Some were not even concerned with their moral rights, the right to be recognised as the author of original material.

It is not clear how to understand this in terms of copyright law. It could have been argued that this behaviour reflected or created a trade custom among hackers. Or, because hackers often used the Internet to share work, it could have been taken as evidence of an implied license that allowed members of the Internet community to use material on the Internet without permission. Certainly, many early Internet users assumed that they were free to use anything they found on the Internet. But it is doubtful that these arguments would have served as a defence if an author had sued for breach of copyright. The second argument reverses the usual legal position in which a copyright holder has to license another to use the copyright holder’s work. And with both arguments it would have been difficult to establish the terms of the license or custom and who qualified as a member of the community to which it applied. But whatever the exact legal position, this was how it was when software developers were mostly academics or researchers who often used the Internet to share scientific or technical information.

Some developers did claim copyright in software they developed. They did this by making their products available as freeware or shareware. Freeware is copyright material which the copyright holder allows others to use without charge. Shareware is copyright material which the copyright holder allows others to use subject to a small charge or condition. Freeware and shareware are not the same as open license software because they do not envisage users continuing to develop and distribute the material.

Growth of Commercial Software

Some of the lack of interest in ownership in computer software may have been because, in the early days of computers, the software was not seen as distinct from the computers on which it ran. But as computers for ordinary users became popular, particularly after the launch of the IBM PC in 1981, it became clear there was a separate market for software for these computers. This market grew as personal computers became more powerful and able to run more complex software. And it received another boost when, towards the end of the 1990s, ordinary users began to access the Internet through the World Wide Web. From the 1970s onwards most countries recognized copyright in software and in 1996 the WIPO Copyright Treaty made it clear that software fell under copyright law. Some commercial software developers became very wealthy from licensing the software they had developed. Some countries have even taken the controversial step of giving software added protection by allowing software patents.

Today businesses are always looking out for new and useful software. If they can acquire rights over the software they will invest in marketing it. When they do this they usually allow only those who pay their license fee to use the software. And they do not usually allow users access to the software’s source code. Source code is the human-readable version of the software used to create the computer program. Restricting access to the source code means that in practice only the software owners can develop the software. Software of this sort is known as “closed software” or “proprietary software”.

Software Open licenses

The hacker community and those who sympathized with their ideals saw the possibility that all software would become closed or proprietary. To stop this happening they developed open licenses of which the following are some of the more important.

BSD licenses

The Berkeley Software Distribution (BSD) license was developed by the University of California, Berkeley and first published in 1989. But some of the BSD software goes back to 1977 and the BSD license is said to embody the conditions under which this software was released. This means the BSD license may have been the earliest open license. Some important software is available under BSD licenses including the software that runs many domain name servers and a Unix-like operating system.

Different versions of the BSD license have developed. BSD licenses have few restrictions on how the software may be used. They differ from the GPL, discussed below, in not insisting that developments of BSD software be distributed on the same terms and in not insisting that source code be made available to those to whom the object code is distributed.

GNU licenses

Richard Stallman is a prophetic figure who campaigns for free alternatives to commercial software and, in particular, for a free alternative to the Unix operating system that AT&T, the US telecommunications giant, developed. In 1985 Stallman published the GNU Manifesto (GNU standing for Gnu's Not Unix) setting out his ideals and established the Free Software Foundation (FSF) to support this work.

In 1989 Stallman published the first version of the GNU General Public license (the GPL). There is also a GNU Lesser General Public license (LGPL) that allows for linking GPL software and software not published with the GPL and a GNU Free Documentation license (FDL) for software development documentation and manuals. The GPL is now in its third version and, about three-quarters of the world's open license software uses the GPL. This software includes the Linux operating system, an alternative to Unix, that Linus Torvald released under the GPL in 1991. The following are some of the main features of this important license.

A powerful (and contentious) feature of the GPL is what Stallman calls "copyleft". Copyleft, shown by a reversed © symbol, means that others are free to develop a GPL work on the condition that any work derived from a copy-left work is distributed subject to a similar condition. This means the GPL license is what some call "viral", it tends to take over software originally published under other open licenses.

Another feature of the GPL is that GPL software must be conveyed with its source code. This is to make it easier to develop the software. Not every open license requires this.

To those who think of software open licenses as anti-commercial, a striking feature of the GPL is the absence of restrictions on using GPL software to make money. As the preamble to the GPL puts it: "Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish) …" In the past few years this has begun to happen. Red Hat, for example, is a company listed on the New York Stock Exchange. It develops and distributes a version of Linux, Red Hat Enterprise Linux. Since 2002 IBM has been offering this as an operating system for IBM computers. Dell, a major supplier of personal computers, has previously offered its computers with Linux operating systems and is now selling some computers with Ubuntu Linux. Even a corporation like Novell that sells software rather than computers, is using a version of Linux, SUSE Linux, as an operating system.

The advantage to these and other corporations of using open license software is that they do not have to develop this software themselves or pay license fees for software others have developed. They get the benefit of the work independent developers put into open license software and can concentrate on improving the products or applications that are their speciality. In return, independent developers get access to the work these corporations put into adapting open license software. Open license developers are also well qualified to work for the corporations and provide support to the corporations' clients. They are even free to market the software on their own account.

The growth of the commercial use of open-license software has not stopped individuals and groups supported by not-for-profit organizations from continuing to develop GPL software. The Shuttleworth Foundation, for example, has sponsored Ubuntu Linux. Ubuntu Linux is meant to be easy for non-technical people to use and, in particular, supports other languages than English. It is this version of Linux that Dell is offering on its personal computers. Ubuntu also has a commercial sponsor, Canonical Ltd, that provides training and support for Ubuntu users.

As already mentioned, anyone who acquires GPL software and develops it may only distribute the developed software under the GPL. But someone who develops original software, meaning here software that is not a development of other software, is free to decide how to license it. Such a developer is free to use more than one license. So software may be distributed under the GPL and another open or proprietary license. This raises the question whether someone who develops original software and distributes it with a GPL license may withdraw the GPL license? Because the GPL is perpetual anyone who acquires a copy of original software from the developer under the GPL is free to continue to use the software. It is not entirely clear whether the developer can prevent those who have already acquired the software from passing it on to others. But it is clear that the GPL does not require a developer to continue to distribute software and this may make it difficult for others to acquire the software. In addition, the GPL does not require the developer of original software to offer further developments of the original software under the GPL. By not offering further developments under the GPL the developer of the original software will lessen the attractiveness of the earlier GPL version.

The GPL came out in 1989. A second version, GPL version 2, came out in June 1991 and GPL version 3 in June 2007. Version 3 has two interesting new provisions. The first is in clause 11 dealing with the GPL and patent rights. The other is in clause 3: “No covered work shall be deemed part of an effective technological measure under any applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, or similar laws prohibiting or restricting circumvention of such measures”. This means a person is free to remove coding of this sort if it appears in GPL software.

Other software licenses

Some software developers use other open source licenses. They may do this because they want to avoid the copyleft restrictions in the GPL that make it difficult to use the software commercially or because they do not want to require licensees to distribute the source code. Or they may have to use another license because the software on which they are working began with a different license. The following are some examples of other software open licenses and how they came about.

Sendmail is a widely used program for managing email that was first published under a BSD license. In 1999, following difficulties in developing and supporting the software as an open license product, a company was formed to do this commercially while leaving the software available under an open license. This called for changes to the BSD license that resulted in the sendmail license. The sendmail license, it has been pointed out, is not listed as an open source license at the Open Source Initiative website discussed below.

Netscape, on the other hand, was a commercial software developer that produced the influential Navigator web browser and Communicator email software. Following competition from Microsoft’s Internet Explorer, Netscape decided to release the source code for these products under an open license while continuing to develop the software commercially. To enable them to do this they produced they Mozilla Public license. The successors to Navigator and Communicator, Firefox and Thunderbird, use this license. Other developers, particularly by those who want to have both commercial and open license versions of their software, also use this license.

The Apache Software Foundation has its own model for software development that has resulted in non-GPL licenses. The Foundation grew out of a community of developers who, around 1995, were working on projects that included the important Apache HTTP Internet server. According to the Apache Foundation website: “All software developed within the Foundation belongs to the ASF, and therefore the members”.

Open Sources Initiative

As the number of open licenses has grown so it has become difficult for non-specialists to understand the differences between them. In 1998 the Open Source Initiative (OSI) was founded to be “the stewards of the Open Source Definition (OSD) and the community-recognized body for reviewing and approving licenses as OSD-conformant” (http://www.opensource.org/about).

The OSD is a list of 10 requirements that software must meet to qualify as open source. The Open Source Initiative keeps a list of licenses it considers comply with its definition of open source. It has a trademarked logo that those whose licenses comply with the definition can use. It might seem it should be possible to use any OSD-compliant software with any other OSD-compliant software. This, however, is not always the case as some of the licenses contain incompatible terms.

Advantages and Disadvantages of Open license Software

Traditionally open license software users were technically sophisticated. They probably shared the ideals of organizations like the Free Software Foundation and may even have helped develop the software they used.

Increasingly, however, open license software users have little or no technical expertise. They simply want to save money by switching to open license software rather than pay for commercial software from suppliers like Microsoft. Stand-alone products like open license products like Firefox and Thunderbird should present these users with few difficulties. But non-technical users are likely to resent having to learn how to use the more complex products that are an alternative to Microsoft Windows and Office. In addition, some of the proprietary software on which an individual or institution depends may not may not be easy to run with open license software or be available in an open license version. Open license software is also likely to need as much support as the equivalent commercial software. Support here means help with installing the software, manuals, training for users and access to experts. Before committing themselves to open source software, users with little technical expertise should check these points and, in particular, be sure adequate support will be available and know what it will cost. Businesses using open license software should also bear in mind that most open licenses disclaim liability for any damage resulting from the software. They may need to consult their insurers.

It is worth noting that some software managers working in higher education institutions have reservations about using open license software for sensitive data. Their concern is that if the source code is available it is easier to attack the software and publish, change, or destroy the data.

Open licenses are popular among educators. But individuals and institutions that distribute their original software with an open license may be giving up the possibility of royalty revenue from those who use their software. They need to weigh this against the advantages of open licensing and the possibility of exploiting their software in other ways. They should also be aware, as has been mentioned, that they have the option of licensing the software with an open and a proprietary license.

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7.2.3: Open Licences for Non-Software Material

The success of open licence software led to an interest in using open licences for non-software material and especially for educational and scientific material. The list of individual and institutional signatories to the Cape Town Open Education Declaration of 2007 (www.cape towndeclaration.org/) shows how much support there is for open licence educational resources (OERs).

Early Open Licences

Open licences for non-software material came some time after open licences for software. The earliest such non-software open licence may have been the Open Content Licence that David Wiley of Open Content published in July 1998. The following year, in June 1999, the Open Content Project published the Open Publication Licence.

GNU FDL

In March 2000 the Free Software Foundation released version 1 of the GNU Free Documentation Licence (the FDL). The FDL was meant for software developers writing manuals and documenting their work but it can be used for other forms of material. Wikipedia, for example, uses the FDL. A revised version, FDL version 1.2, appeared in November 2002 and the Free Software Foundation is working on version 2. The FDL, like the GPL, allows for commercial publishing. If, however, the GNU website list of 30 or so commercially published FDL books is complete (gnu.paradoxical.co.uk /doc/other-free-books.html), FDL material is not yet as attractive to commercial publishers as the GPL software is to commercial software developers.

Creative Commons Licences

Open licences for non-software material began to attract serious attention in 2001 when Lawrence Lessig and others started Creative Commons (CC). The CC licences are now the most important open licences for non-software material.

CC rights

The CC licences are based on the CC analysis of copyright rights. This distinguishes between four rights of a copyright holder. The CC website lists and explains these rights:

> “Attribution. You let others copy, distribute, display, and perform your copyrighted work—and derivative works based upon it—but only if they give credit the way you request.”
>
> “Noncommercial. You let others copy, distribute, display, and perform your work—and derivative works based upon it—but for noncommercial purposes only.”
>
> “No Derivative Works. You let others copy, distribute, display, and perform only verbatim copies of your work, not derivative works based upon it.”
>
> “Share Alike. You allow others to distribute derivative works only under a license identical to the license that governs your work.”

All the CC licences include what CC calls the “Baseline Rights”. These are the rights to copy, distribute, display, perform publicly or by digital performance and to change the format of material.

CC licences

In theory the four CC rights, used singly or combined, allow for eleven different possible licences. In practice CC offers only six licences. These licences allow copyright holders to grant users different combinations of the CC rights. This flexibility makes the CC licences more attractive to authors than the all-or-nothing open licences that are usual for software. As the CC website says:

> Creative Commons defines the spectrum of possibilities between full copyright—all rights reserved— and the public domain —no rights reserved. Our licenses help you keep your copyright while inviting certain uses of your work—a “some rights reserved” copyright.

The CC website has a diagram that shows the spectrum from copyright to public domain with CC licences occupying the space between these two:



Figure 7.2.3.1

CC also takes into account that copyright law differs from country to country. As well as a generic or unported version of each licence CC aims at providing a version, in the appropriate language, adapted to the law of each country where the CC licences are used. This means there is no one CC licence in the way there is one GNU GPL. With CC licences it is always necessary to specify which national version of the CC licence is being used, and, in some cases, the language version of the licence.

In addition to the CC licences, CC provides a form for an author to place a work in the public domain. This is only legally possible in some countries. CC also has a procedure for recreating the original US copyright term of 14 years.

CC uses symbols and abbreviations to represent the four rights of a copyright holder and combines these symbols and abbreviations to represent the different licences. The names, abbreviations, and symbols of the six CC licences give some idea of the complexity of the CC licence system:

- Attribution Non-commercial No Derivatives (by-nc-nd)
- Attribution Non-commercial Share Alike (by-nc-sa)
- Attribution Non-commercial (by-nc)
- Attribution No Derivatives (by-nd)
- Attribution Share Alike (by-sa)
- Attribution (by)

CC licence generator

The text of the CC licences and their different language versions is on the CC website. The CC website does not, however, expect users to study every licence before choosing one. Instead, there is a licence generator that suggests the appropriate CC licence based on the answers to following three questions:

- Will an author allow commercial use of the work?
- Will an author allow users to modify the work? (Included under this question is the possibility of allowing users to modify the work if they share alike.)
- In which jurisdiction does an author want to license the work?

The questions are a convenient starting point for commenting on the six CC licences.

Jurisdiction

It is useful to start with the third question on the jurisdiction of the licence. If a work will be used mainly in one country an author should select that country. If an author is publishing a work internationally or if there is no licence for the country in which the author is publishing, the author should answer ‘unported’. The unported version of a licence is a generic, international licence. The following discussion of the other questions will refer to the unported versions of the licences.

Restriction on commercial use

The first question the licence generator asks is: “Allow commercial use of your work?” If the copyright holder does not want to allow commercial use of the work the licence generator suggests a non-commercial (NC) licence. What this means is that a copyright holder who finds individuals or institutions making commercial use of the work can take legal steps to stop them doing this. But what does non-commercial mean? Section 4b of the unported CC Attribution-Non-Commercial 3.0 licence says:

You may not exercise any of the rights granted to You in Section 3 above in any manner that is primarily intended for or directed toward commercial advantage or private monetary compensation. The exchange of the Work for other copyrighted works by means of digital file-sharing or otherwise shall not be considered to be intended for or directed toward commercial advantage or private monetary compensation, provided there is no payment of any monetary compensation in connection with the exchange of copyrighted works.

One view of what this means, often forcefully expressed in workshops and discussion groups, is that noncommercial means that no money should change hands. This is not, however, the usual meaning of noncommercial. It is not a commercial transaction, for example, to refund someone for buying me a loaf of bread or even to pay that person’s travelling expenses. It only becomes commercial if that person wants to make a profit out of providing this service. It follows that someone who distributes an NC work should be able to charge to recover expenses incurred in distributing the work. These expenses, typically, would include copy

charges, salaries and overhead expenses. The only restriction is that anyone doing this does not intend to make a profit out of distributing the work. This is the view of the Draft Guidelines that CC published to try to clarify the meaning of non-commercial. ("Proposed best practice guidelines to clarify the meaning of 'noncommercial' in the Creative Commons licenses" available at wiki.creativecommons.org/DiscussionDraftNon Commercial_Guidelines)

There is still some uncertainty, however, about what "primarily intended for or directed toward commercial advantage or private monetary compensation" in section 4b means. It could be argued that even if a project does make a profit, the use is still non-commercial if the project was not primarily intended to make a profit. According to this view, an organization that is run for profit may use NC material and may recover its expenses for distributing NC material provided the project using the NC licensed material does not aim at making a profit.

This raises questions such as whether private schools run for profit or public broadcasters that accept advertising revenue may use NC-licensed material for teaching or informing their viewers? (See Mikael Pawlo, "What is the meaning of non-commercial" in Danièle Boucier & Mélanie Dulong de Rosnay, International Commons at the Digital Age: La création en partage 2004 Romillat, Paris 69 at 78–82. Available at fr.creativecommons.org/iCommonsAtTheDigitalAg e.pdf) Another question is whether a business whose profits support a non profit body such as a university may use NC material. The Draft Guidelines appear to prohibit using NC material in these ways. Section C(2) of the Draft Guidelines, for example, says that it is not non-commercial if money changes hands to, for example, a for-profit copy shop. Section A(1)(b) insists that an educational institution or library using NC material must be nonprofit. And section B appears to classify as commercial any use of NC material in connection with advertising.

What the Draft Guidelines say, however, does not settle the matter. The Draft Guidelines are not part of the NC licence. As section 8e of the NC licence says: "This License constitutes the entire agreement between the parties with respect to the Work licensed here." And a notice at the end of the licence says "Creative Commons is not a party to this License, and makes no warranty whatsoever in connection with the Work." The Draft Guidelines themselves do not claim to be an authoritative. CC published them to "elicit feedback about whether these guidelines accurate reflect the community's (including both licensors and licencees) understanding of the term". This means that what the Draft Guidelines say should be treated with respect but any dispute between a copyright holder and a user can only be settled on the basis of what the licence says. This raises the question whether any ambiguities in the wording of the licence should be interpreted strictly, to limit the use of NC material, or generously, to allow the widest use of a work.

CC plans to return to the question of the meaning of non-commercial. It would be helpful to know what authors who use the NC licence really want to achieve. They do not want royalties for their work but they do, presumably, want the work to be made widely available. If these authors object to associating their work with commerce in any way, the Draft Guidelines should be followed. If, on the other hand, these authors want only to avoid commercial interests taking over and restricting access to their work, the authors may be prepared to allow their work to be used by organizations or individuals working for their own profit provided they do not limit further distribution of the CC work. And this could be achieved by using a SA ShareAlike licence.

As with all the CC licences, it is always possible for a commercial user to approach the author of a work directly and ask for permission to use CC licensed work in a way the CC licence does not cover.

Modifications allowed

Once a user has decided whether to allow commercial use, the licence generator's second question is: "Allow modifications of your work?" There are three possible answers to this question: "Yes", "No", and "Yes as long as others share alike".

Particularly where the licensed material is educational material, users are likely to want to modify it by adding examples and other material, by translating it into another language or adapting it in some other way. The licence generator will suggest that those who want to allow users to modify their material use either a simple attribution (BY) licence or an attribution non-commercial (BY-NC) licence. Which it suggests will depend on the answer to the first question: "Allow commercial use of your work?"

The simple attribution licence, not combined with a NC restriction, allows a user to do anything with the material except claim copyright in it or authorship of it. A user may modify the material or leave it as it is and market the modified or original material commercially and keep any profit.

No modifications

If the answer to the licence generator's second question "Allow modifications of your work?" is "no", the licence generator will suggest an ND (no derivate works) licence. The human readable summary of version 3 of the unported Attribution-No-Derivs

licence says: “You may not alter, transform, or build upon this work.”. The legal code prefers to speak of not adapting a work. Section 1a defines adaptation as:

> a work based upon the Work, or upon the Work and other pre-existing works, such as a translation, adaptation, derivative work, arrangement of music or other alterations of a literary or artistic work, or phonogram or performance and includes cinematographic adaptations or any other form in which the Work may be recast, transformed, or adapted including in any form recognizably derived from the original, except that a work that constitutes a Collection will not be considered an Adaptation for the purpose of this License. For the avoidance of doubt, where the Work is a musical work, performance or phonogram, the synchronization of the Work in timed-relation with a moving image ("synching") will be considered an Adaptation for the purpose of this License.

This means that a ND licence allows users to use, reuse and distribute a work but not adapt it.

There are situations where an ND restriction is necessary. If a work is a report or set of standards, it makes sense to insist that it is only used in its original form. Changes to a work of this sort destroy its value. Even valid corrections can be harmful because they give readers a false impression of the accuracy of the original report.

The ND restriction is also necessary if an author wants to distribute a work for comment while reserving the right to publish the final version of the work.

Some educators dislike the ND restriction and say it makes it difficult for them to use material most effectively. But the ND licence does allow for an ND work to be used in a collection. (Some versions of the ND licence call this a collective work.) Section 1b of the legal code defines a collection as:

> a collection of literary or artistic works, such as encyclopedias and anthologies, or performances, phonograms or broadcasts, or other works or subject matter other than works listed in Section 1(f) below, which, by reason of the selection and arrangement of their contents, constitute intellectual creations, in which the Work is included in its entirety in unmodified form along with one or more other contributions, each constituting separate and independent works in themselves, which together are assembled into a collective whole. A work that constitutes a Collection will not be considered an Adaptation (as defined above) for the purposes of this License.

This means that provided the ND work is reproduced whole and unmodified it can be published in a collection with a commentary or other relevant material. It is not clear whether it would be permissible to use hyperlinks to take a user directly to parts of an ND work or to connect an ND work to a commentary or other material.

Section 4 of the legal code goes into detail about how an ND work can be incorporated into a collection and how the work must be credited. It is possible to assemble a collective work consisting of materials carrying different licences. A collection may also, if it is sufficiently original, qualify for copyright protection and for its own licence which does not have to be an ND licence. When this happens the collective work’s licence will not change the licences attaching to the components in the collective work.

Share Alike

If the answer to the licence generator’s second question “Allow modifications of your work?” is “Yes, as long as others share alike” the licence generator suggests a share alike (SA) licence. This ensures that modified works based on the licensed material are available to others under the same conditions as the original work. The share alike licence offers authors the possibility of making their work “viral” in a way that is similar to the GPL. Version 3 of the unported of the Attribution-Share-Alike licence says:

> You may Distribute or Publicly Perform an Adaptation only under the terms of: (i) this License; (ii) a later version of this License with the same License Elements as this License; (iii) a Creative Commons jurisdiction license (either this or a later license version) that contains the same License Elements as this License (e.g., Attribution-Share-Alike 3.0 US); (iv) a Creative Commons Compatible License. The CC’s symbol for share alike is almost exactly but not quite the same as the FSF’s symbol for copyleft.

Attribution

All the CC licences require what CC calls attribution. The human readable summary of version 3 of the unported Attribution licence explains what attribution means:

> You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work)

Changing or withdrawing a licence

The CC licences all say the licence is for the duration of copyright and only ends if the person holding the licence breaks the terms of the licence. Section 7b of version 3 of the unported Attribution licence, for example, says:

> Subject to the above terms and conditions, the license granted here is perpetual (for the duration of the applicable copyright in the Work).

Whether an author can stop those who have not begun using the material, from acquiring rights in terms of the original licence is an awkward question. Section 8a of the licence suggests that an author cannot do this:

> Each time You Distribute or Publicly Perform the Work or a Collection, the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License.

There is a problem with this clause in that the identity of the "relevant third party" is unknown until someone begins to use the work. This means that an author is bound to an uncertain person. Not every legal system accepts that this is possible. If an author does withdraw a licence this will not affect the rights of those who had previously begun to use the material.

Concluding comments on CC licences

There was no CC equivalent to the GNU Manifesto although there is now a "Free Content and Expression Definition" that may serve as a manifesto. It seems, however, that what the founders of the CC movement had in mind was a community producing material that it would make available under the CC licences in the same way as there are communities of software developers. making software available under different licences. There two features of the CC licences that might hinder this.

First, the system of CC licences is complex and, as has been shown, the meaning of the licences is not always clear. A pre-publication review of this chapter advised against publishing some of the comments for fear that they might weaken confidence in the CC licences. It seems, however, that long-term confidence in the CC licences will only be possible when difficulties of the sort this chapter raises have been resolved.

Second, and possibly more importantly, authors and educators 'need to eat'. Those in regular employment and those supported by public or private grants may be happy to use the CC licences. But authors earn their living from their work might be reluctant to use the CC or any other open licence. Commercial publishers, whether they publish traditionally or online, are unlikely to want to pay authors for the rights to publish a work that is already freely available. And it is difficult to see how there could be a commercial use for non-software open-licence material in the way there is for open licence software.

Other Non-Software Open Licences

Some authors draft what are, in effect, their own open licences. This can be done quite simply. So, for example, the copyright notice on the Antiquarian Horological Society's Website (www.ahsoc.demon.co.uk/) reads:

> The material in these pages is copyright. © AHS and Authors. 1996 – 2007. The information may be downloaded for personal use only. The information may be passed on to another party for their private use provided that the source and this copyright information is acknowledged. The material may not be reproduced in quantity, or for commercial purposes.

Open licence drafting, however, is not always a simple matter and not every home-grown licence is free of problems. The United Nations Disaster Management Training Programme, for example, has the following licence on some of its training material:

> The first edition of this module was printed in 1991. Utilization and duplication of the material in this module is permissible; however, source attribution to the Disaster Management Training Programme (DMTP) is required.

In this licence it is not clear whether 'utilization and duplication' includes making derivative works and using the material commercially for profit.

The African Medical Research Foundation, to take another example, has licensed some of its educational material with CC Attribution-Share Alike licence. The Foundation then goes on to explain that copying, reproducing and adapting the material is "to meet the needs of local health workers or for teaching purposes". It is not clear if this limits the CC licence. The Foundation also asks, although not as a term of the licence, for feedback on how the material is being used:

> This course is distributed under the Creative Commons Attribution-Share Alike 3.0 License. Any part of this unit including the illustrations, may be copied, reproduced or adapted to meet the needs of local health workers or for teaching purposes, provided proper citation is accorded AMREF. If this work is altered, transformed or built upon, the resulting work may be

distributed only under a license identical to this one. AMREF would be grateful to learn how you are using this course, and welcomes constructive comments and suggestions.

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7.2.4: Access to Knowledge and Information Sharing

There is a growing awareness of the importance of access to knowledge and information and of the need to prevent commercial exploitation from making important knowledge the preserve of relatively few. An example of this was President Clinton's decision to increase funding for the Human Genome Project to ensure that the sequences were not patented and limited to commercial use. When discussing access to knowledge it is useful to distinguish different kinds of knowledge or information.

Governments have detailed information about matters such as the health, safety and education of the population, trade figures, economic performance, spatial information and geodata. They collect this information for their own purposes and, in terms of the law of most countries, they have copyright in it. Such information, of course, is often also useful to researchers and commentators and to those thinking about investing in the country either to make a profit or to help development. There is, however, no single approach about whether and on what terms this information should be available.

In 2005 Brazil and Argentina proposed to the World Intellectual Property Organisation that the organization's development agenda should discuss the possibility of a Treaty on Access to Knowledge (A2K). Much of the draft of the treaty deals with widening the scope of the exceptions to and limitations on the copyright holders' rights. Part 5 is entitled "Expanding and enhancing the knowledge commons" and includes articles providing for access to publicly funded research and government information and a provision that government works should be in the public domain.

A category of government information to which some countries already allow access is material of a legal, judicial or political nature: legislation, case law, and parliamentary proceedings. In 2002 delegates from some Commonwealth countries produced a 'Declaration on Free Access to Law' that asserts, among other things that "(p)ublic legal information is digital common property and should be accessible to all on a non-profit basis and free of charge; …" Anyone who has followed the discussion in this chapter and reads the full declaration will realize that the declaration needs to go into more detail about creating derivative works and using the material commercially.

Tax exempt foundations and not-for-profit educational and research institutions also fund research that produces important information. According to the law in most countries, funders and employers can decide on what terms to release this information. It is understandable that researchers looking for funding may want to include a profit line from intellectual property in their research proposals. Educational institutions also like the idea of using the research done by their staff to produce what some call "third stream" income. It could also be seen as part of academic freedom that academics who work in educational and research institutions are entitled to a say in how their research is released. Access to knowledge advocates could argue that governments should consider whether institutions and funders that do this are really entitled to their tax-free status.

Creative Commons works through Science Commons to encourage the free flow of scientific information. One of the Science Commons projects has drafted model contracts for the transfer of biological material. Another project aims at publishing material that is important for biological research with an open licence. A third project aims at getting peer reviewed journals to publish with open licences and enlisting academics to publish only in journals that do this.

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7.2.5: Concluding Comments

In conclusion it seems worth mentioning two features that most open licences lack: provision for notifying the copyright holder about how material is being used and provision for alternative dispute resolution.

Notification

It is surprising that open licences do not allow an author to require a user, in return for being free to use the author's material, to keep the author informed about what a user does with the material. The African Medical Research Foundation's licence requests this information but it is not a condition of using the material. Drafting such a condition, of course, would have to be done so as not to impose too much of a burden on users. But if it could be done the information would help assess the value of open licence material.

Alternative Dispute Resolution

We have seen the different opinions about what some of the clauses in the CC licences mean. And there has been litigation about the meaning of the GPL. As things stand only a court, possibly even a whole series of courts in different countries, can settle differences of opinion. Given the cost of litigation, it is unlikely that the courts will ever have an opportunity to do this. In 1999 ICANN adopted a Uniform Domain-Name Dispute-Resolution Policy for settling disputes about domain names. There is no reason why there should not be a similar dispute resolution procedure for settling disputes between copyright holders and users about the meaning of open licences.

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CHAPTER OVERVIEW

8: Module 08- Online Conferencing, White Board, and Screen casting Tools

8.1: Virtual Classrooms/Web Conferencing

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8.1: Virtual Classrooms/Web Conferencing

Web conferencing tools can bring a new dimension to your programs. They add presentations, audio, video, graphics, synchronous chat and voice interactions to meetings and classes at a distance. They can effectively complement online courses where some live interaction is called for and where there is an immediate need for new information or skills. Recordings can often be made to enhance asynchronous distance education programs. In an education/training mode, they are often referred to as virtual classrooms.

With a few exceptions, virtual classrooms are not included as part of an LMS, either for education or business, but are available separately. Some LMS vendors partner with web conferencing software vendors to integrate the products so they will work well together.

There are more than 50 vendors of these products. In most cases, these systems can support either corporate or education needs. Some of the best known include:

- Centra Live (now owned by Saba)
- Citrix GoToMeeting
- Elluminate
- Horizon Wimba
- iLinc LearnLinc
- Interwise Connect
- Adobe Acrobat Connect Professional (formerly Macromedia Breeze Live)
- Microsoft NetMeeting (free but apparently no longer supported)
- Microsoft Live Meeting (formerly Placeware)
- Tapped-In (a free text-only based conferencing system)
- WebEx Training Center

Licensing of these products varies from annual subscriptions (Elluminate) to pay-as-you-go (WebEx) to free (TappedIn). If they are only used occasionally, then the pay-as-you-go option is probably the best choice. However, that can rapidly get very expensive.

> **Tip**
>
> As with any software or instructional approach, it takes considerable skill to facilitate an online session effectively.

Learning Content Management

The management of learning content involves saving developed courseware as learning objects in a learning object repository (database). It is catalogued using metadata (descriptive tags) so that it can be easily found and retrieved by anyone who has access to it. It supports institutional or corporate reuse of the learning objects. Systems that do this are often called learning content management systems (LCMS). They are specialized content management systems.

Most education LMSs include at least some capability for content management. Some even call themselves learning content management systems.

Learning content management is not usually a feature of the corporate LMS, but some of the major corporate LMSs include content management as part of a suite of programs. It is also available separately. Most separate LCMSs include content authoring and some learning management features as well.

Performance support: Some corporate LCMSs provide for a feature called performance support. Also called JIT (just in time) learning, performance support allows employees to immediately access information (courses, units, and learning objects) that enables them to do their job better “in the moment”. For example, if an employee working on a task cannot remember exactly how to do something, he or she can quickly access a course, or parts of a course, that will show how to perform the operation. This requires managing the course content as learning objects, and making them easily accessible to all learners. Such systems when available separately are often called EPSS (electronic performance support systems) but are now sometimes included as part of an LCMS. This is another concept which does not really apply in the education environment. See Appendix C, LCMS Features.

LMSs that include this capability as part of a suite include:

- Cornerstone OnDemand
- Generation21

- GeoLearning
- KMx
- LearnCenter
- Plateau
- Saba
- Sum Total Systems

Some examples of separate systems are:

- Chalk Media Chalkboard
- dominKnow LCMS (formerly Galbraith Media)
- Eedo
- Outstart

> **Tip**
>
> Be careful about learning content management. Everyone thinks, “What a great idea—save the course materials in a way that they can be reused easily.” But too often it doesn’t happen. Some organizational cultures do not support the value of sharing. This is a great tool if it is used but an expensive mistake if not used.

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CHAPTER OVERVIEW

9: Module 09- Teacher Collaboration and Professional Development in the Digital Age

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9.2: Supporting E-learning through Communities of Practice
9.3: Building Communities of Practice
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9.1: How can teachers continue to learn throughout life?

by Christa Portlock

“Give a man a fish, feed him for a day. Teach a man to fish; feed him for a lifetime.” The founder of Taoism, Lao Tzu, spoke these words over 2000 years ago. (Smith, xi) Education is similar to this principle. For centuries students were “fed” information and taught to memorize facts, in the hope they would retain a portion of what was taught. Today it isn’t enough just to feed information to students. Our world is changing so fast that new information becomes available faster than it can be taught. If a nation wants to keep pace with this ever-changing world, then learning can’t stop at graduation. Students as well as teachers must learn “how to fish” for knowledge by becoming life long learners. Teachers can become life-long learners by realizing and acknowledging that life long-learning is a necessity; by learning to keep up with changes through personal and professional development; and by teaching with passion, inspiring young minds to see learning as something wonderful.



Figure 9.1.1: Image 1, Students as well as teachers must learn "how to fish" for knowledge by becoming life long learners (Public Domain, CK209, Wikimedia)

Life-long Learning is a Necessity

The last century has brought about an explosion of inventions, new technologies and new information about our world and universe. Teachers have had to keep up with all the new information and knowledge. What would it be like if they hadn’t? Picture a classroom somewhere in America. The teacher has been teaching for many years; she might be in her 50’s. That means she started teaching during the 1970s. Think back about 30 years. What were American schools like then? What kind of things would you have found in her first classroom? Classrooms in those days had chalkboards and pull-down maps. Some schools had TVs, film- and overhead projectors that were shared between classes and could be rolled into the room. Calculators existed but were generally not used in the classroom. Now imagine for a minute what it would be like if this teacher had not adapted to change. What would it be like if she had buried herself in her classroom, not furthered her learning, not embraced all the new technologies, events and discoveries? If she had not been a life-long learner, what would she have missed? What would she not have learned, embraced, and passed on to students? Think of the things that have happened in the past 35 years. She would have missed, among other things, the hostage crisis in the late 70’s, Presidents coming and going, this country at war more than once, the attack of 9/11. She would not have seen the Soviet Union collapse, would not have heard of Aids or global warming. She would not have known much, if anything, about DNA. She wouldn’t know how to use a personal computer, the internet or cell phones. It is easy to see that if we stand still the world will pass us by. We live in a global society that is changing at breathtaking speed. We need to adapt and change. Life-long learning is a necessity for everyone.

Personal and Professional Development

In order to keep up with our changing environment and to stay informed, teachers make a conscious effort to continue learning. They will take part in professional training through the school district or through classes taken at universities. Most teachers read books and professional journals to keep up with the newest information about child development. They read magazines,

newspapers, watch the news and surf the internet to keep up with changes that happen around the world. Teachers attend workshops to keep up with technology, the newest teaching strategies, and classroom management techniques. They are eager to take in new information about our world and look for ways to improve their teaching practices in the classroom. Another way a teacher can improve and move forward is to learn more about him or herself. In the book Those Who can, Teach by Ryan Cooper, a teacher is likened to a sculptor who "begins with a vision of what he or she wants to be and then sets to work transforming the vision into a reality… The process requires an understanding of … self … it takes long hours of chipping away and then smoothing the surfaces… To be a teacher, particularly a teacher who is continuously moving forward, is a lifelong commitment …" (Cooper, 473) A sculptor needs time, patience and the ability to see beyond what is easily visible on the surface to create his work of art. A teacher uses those same qualities, just like a sculptor, to patiently reflect and look deep within him- or herself to see where changes could be made. At the end of a day it is helpful for a teacher to think deeply about the events of that day, to analyze him- or herself and therefore better understand and react to situations in the future. It is good to take time to remember happy events, a chance to feel content about good things that may have happened. Reflection can help a person to learn and adjust to his or her environment. As previously discussed, teachers have to become life-long learners and have to adjust to keep up with our ever-changing world through personal and professional development. They are however, not the only ones who need to keep pace with new information and technology. One of the reasons it is so important for teachers to stay informed, is so they can pass this new knowledge and information on to students.

Teaching with Passion

Note

If we can have "students see our passions – it gives them proof that we enjoy learning." (Thomas, 2007)

Children have a sense of wonder when they are young. "Keeping the joy in learning should be a priority of every school and every teacher." (Warner, 2006)If children can keep their sense of excitement about the world, they will love to learn and that original excitement and love of learning will most likely stay with them for life. To help keep the excitement alive, teachers aim to inspire young minds. They want their students to see how much fun learning can be. In the article "A Return to Community: Inquiry in Action" Ann H. MacKenzie wrote: "Life-long learning implies a buy-in curiosity about life... an insatiable desire to be alive in 'the now, the future,' and immersed in the teeming life surrounding us every moment." (Thomas, 2007) If we can have "students see our passions – it gives them proof that we enjoy learning." (Thomas, 2007) It is wonderful to see the sparks when students understand a concept and take off excited with their new-found knowledge. "We must model that inquisitiveness in the classrooms. Our students must see us involved in our own life-long learning… Watch us passionately immerse ourselves in our own curiosities." (MacKenzie)

When teachers model excitement about learning, students will see learning as something positive to be imitated. In turn they will hopefully become life-long learners themselves. Rafe Esquinth wrote an inspiring book entitled Teach Like Your Hair's on Fire. He teaches in a "rough" Los Angeles neighborhood and found a way to inspire his students to learn, imagine, and eventually succeed in school. Esquinth relates a story about a day that didn't start out well. In the course of that day he became so involved in teaching that unbeknownst to him, his hair caught on fire during an experiment. He was so involved in teaching, he didn't even notice. That day he realized that the key to teaching was to become absorbed and excited about learning. He was determined from then on to make his goal to "teach like his hair is on fire". (Esquinth, xii) If we can convey to students excitement about a subject, about learning, and about life we will teach as if our "hair is on fire". That kind of excitement will inspire children to become life-long learners.

Note

"We must model that inquisitiveness in the classrooms. Our students must see us involved in our own life-long learning… Watch us passionately immerse ourselves in our own curiosities." (MacKenzie)

Conclusion

As individuals and as citizens of a global economy we have to keep pace with our world. We must continue to learn and then pass our knowledge and love of learning on to the next generation. We have to inspire the next generation to find joy in continuous learning so that, even after leaving school, students will be prepared for this ever-changing world, ready to embrace a world filled with new, exciting things, ready to investigate and ready to keep learning, never giving up on their quest for knowledge. A fish is

only one meal… we want to teach students to be excited about learning, excited about fishing for information; we want to give them the tools to become life-long fishermen for knowledge.

Exercise 9.1.1

1)Does learning stop at graduation? Why?

a)Yes, because there are too many other things to do.

b)Yes, because learning makes hair catch on fire.

c)No, because it's important to keep up with our ever-changing world.

d)Of course we stop learning at graduation! We're done with school!

2)What is an example of professional development for teachers?

a)Reading articles about child development

b)Attending workshops

c)Keeping up with technology

d)All of the above

3)What is an important part of personal development for teachers?

a)Developing a seventh sense

b)Getting a pedicure

c)Practicing reflection

d)Joining a teacher's organization

4)How does the practice of reflection help a teacher?

a)Reflection helps a teacher learn about him or herself.

b)Reflection can help a teacher to learn about and adjust to his or her environment.

c)It's important for a teacher to see her own reflection to make sure she looks proper before entering the classroom.

d)Both a and b.

5)Why is it important to teach with passion?

a)It gives children proof that we enjoy learning.

b)It shows children that learning is something positive to be imitated.

c)It keeps excitement about learning alive.

d)All of the above.

Answer

1. c
2. d
3. c
4. d
5. d

Reaction Paper

My Thoughts About Life-long Learning

by Christa Portlock

Investigating life-long learning and what it means made me think about what it means to me as a student and as a prospective future teacher. To me the world has always been a very interesting, exciting, and beautiful place to investigate and to learn about. I can't imagine what my life would be like without that wonder and appreciation about learning new things. Life is so much more stimulating, rich and pleasurable when we engage our minds, use our imagination and fill our hearts with the beauty that surrounds us. I would love to pass that excitement on to someone else. It would be exciting to spark the imagination of children and watch them find the same joy that I have always felt when learning something new. I know I have much to learn to be able to know how to best pass on knowledge, as well as excitement about learning. I am on a learning quest right now. I want to learn how to become that teacher who can create those sparks that light up a child's eyes and light his or her path through life with inquisitiveness and excitement. I will spend the next few years in school learning all I can. I have spent much time in classrooms in the past, but from this time on I will be spending time in the classroom watching with different eyes. I will have chances to observe experienced teachers. I will spend time reading about teachers that were able to make sparks and even small miracles happen, like Helen Keller. I know, however, that this is just the beginning of my journey. Most of my learning about teaching will come through the time spent in the classroom. I want to venture and say that many of my most profound lessons will be taught to me by my future students without them even knowing they've been teaching me. I am looking forward to those lessons and am excited about what is to come. As a teacher I will continue to learn. I will take advantage of the training opportunities offered to me and learn individually as well. I hope I will have the opportunity to work with a mentor, learning through observation. I am excited about all the new things to learn and embrace. Life-long learning goes beyond the time spent at school; it goes beyond the classroom and beyond the teaching years. Life-long learning is an adventurous journey through life. Keeping the mind active has enormous health benefits, physically, mentally and spiritually. Life-long learning has the ability to shape, influence, and determine the future. It has the ability to influence mankind's achievements, technologies, and ultimately our destination through individuals who never stand still and make life-long learning their quest that fuels their investigations. Who knows what sparks will fly when the imagination soars in our future classrooms? I am determined to find out!

Essay Question

How can a teacher be likened to a sculptor?

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SECTION OVERVIEW

9.2: Supporting E-learning through Communities of Practice

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SECTION OVERVIEW

9.3: Building Communities of Practice

Learning Objectives

- Discuss technology's effect on social practices within a community.
- Identify resources that rationalize the design theory for developing information and communication technologies (ICTs).
- Define and apply the following technical terms as they apply to computer interactions:
  - platforms
  - applications
  - services
- Explain the relevance of technical standardization to interpersonal communication tools such as email.
- Describe underlying processes (recording, referencing, and publishing data) that occur in mainstream commercial applications such as Microsoft Outlook®.
- Identify facilitation and sequencing techniques that may enhance digital community interactions.
- Describe how modelling tools can support community involvement in the development of digital community infrastructure.

9.3.1: Introduction - The Turkey Boat Problem

9.3.2: Building Blocks

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9.3.1: Introduction - The Turkey Boat Problem

Each spring an excited group of athletic individuals filter into the small and close-knit whitewater rafting community. Upon arriving at the river community these trainees are given a place to camp, and an opportunity to ride along with the senior guiding staff. Although the senior guides are tolerant of the new arrivals, they recognize that, in an average training year, only one third of them will eventually become guides.

Over several months, the new arrivals will be asked to practise rescue techniques, learn to read complex whitewater hydraulics and develop sound decision-making abilities within highly stressful and quickly changing conditions.

Only after these hard skills have been attained can trainees begin to comprehend the immense responsibility they hold for the safety of others. In an effort to manage the risks inherent in rafting, guides need to develop their problem-solving techniques before they progress into dangerous situations. Whitewater guides must understand that each participant plays an important role in an interdependent team, which must coordinate efforts in order to successfully navigate treacherous and complex whitewater rapids.

Often people who want to become a professional guide see the role of guiding as a burden to be shouldered through physical strength and expertise. Indeed, physical competence is an important component however, the importance of the other team members within the boat is often underestimated. This lack of recognition can quickly lead to failures in communication— creating an environment where accidents can occur.

The turkey boat is used in raft guide training to address the importance of teamwork and communication. A team of guide hopefuls (around eight, total) with little or no direct advice, are given a whitewater raft, paddles, life jackets and helmets and told to navigate difficult whitewater rapids.

Much like learning to drive a car, the kinetics of whitewater rafting are not overly complex. Your paddle works as the steering wheel, gas pedal and brake. And as with driving a car, once the basic kinetics have been learned, confidence quickly follows. Unlike a car, however, a raft can be controlled by any of the individuals holding a paddle—and to complicate matters, each individual is viewing the river from a different location. So the turkey boat consists of eight individuals, armed with minimal technical knowledge and growing (sometimes inflated) confidence, eagerly striving to prove their leadership ability.

Leadership development schools such as Outward Bound have taught basic sports psychology for years. The idea behind these schools is that group development progresses through stages. Further, these stages can be used to develop tools that facilitate highly dynamic group interactions. Although raft guiding activities can be classified as adventure recreation, or perhaps even educational, the focus of guide training programs are to build physical and social competencies, including guiding technique, communication, respect, and problem-solving. Because of this focus, guide training programs can be described as a developmental adventure education.

Developmental adventure education contains a strong process-based component. This process can be used to assess the goals of the group and attempt to facilitate a trajectory of learning for the participants. These trajectories work to place engagement in activities in the context of a valued future within the group. In this way, learning can be experienced as a form of identity.

The adaptation of personal behaviour is the foundation of developmental adventure education. Facilitating the process of adaptation guides the participant in developing an understanding of group expectations, norms and behaviours.

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9.3.2: Building Blocks

The leadership concepts and lessons of the turkey boat also apply to community interactions.

In this section we look at theories of community development, balanced with an understanding of how digital communities, and technology generally, have pervaded daily lives.

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9.3.3: Conceptual Investigations

The emerging nature of cyberspace has caught the imagination of writers for decades. Prolific science fiction writers in the mid-1980s introduced what were then radical ideas about how the Internet would create a space for perfect regulation.22 Today, this question of regulation has become more relevant then ever before. Increasingly society is using the Internet for commercial enterprise. As a result, control is coded by commercial interests, and backed by government legislation.23 Yet resistance to this control is spreading throughout many digital communities that perceive themselves as being oppressed.

For some founders of the digital era such as Linus Torvalds25 ,the ability to communicate and share information has always been fundamental to both personal and professional development. These technological pioneers have attempted to provide the tools for individuals to contribute to a community. These contributions allow individuals to create, adapt and adopt the rules that govern the digital community's very social fabric—its code.

Information within Cyberspace

It is the ability for individuals to contribute to the community that provides the context for information to be applied to practices. More generally stated, our participation within the digital world allows individuals to build relationships with others. These relationships form the foundation for our collective social interactions within the online space.

It is only recently that researchers have begun addressing the social consequences of new technologies. Our optimistic perception that technology will radically transform our business processes have been somewhat tempered in recent years. Researchers are beginning to realize that "technology does not have any impact per se, it is all a matter of choices, power and situated change— the digital economy is not evolving by itself; it is all about choices at the societal, company and individual level" (Anderson, Fogelgren-Pedersen & Varshney, 2003, p. 211). The management of the technology that controls information is becoming increasingly important.

This chapter assumes that the important choices regarding the very design of digital communication must be based on the values of the community using the technology. As technology continues to shape society's material structure, individuals and organizations must work to regulate these technological developments by supporting initiatives that represent the values of the community.

The Role of ICTs in Community Practices

The need to support community practices through information and communication technologies (ICTs) is not a new idea. The evolution of document retrieval systems—historically used to store publications, and searched through keyword indexes—has changed into something substantially more sophisticated. A similar evolution has occurred in software applications once designed as contact databases that now offer fully featured customer relationship management (CRM) applications. These similar forms of information and communication technologies (ICTs) have been met with mixed success. Horwitch and Armacost of Bain & Company suggest that the cause of this mixed success stems from poor deployment.

Critics will point out that consulting companies have a vested interest in advancing high-tech solutions (Oshea & Madigan, 1997, p. 92). Furthermore, despite the fact that many clients will face similar issues, these consulting companies sell themselves on their ability to develop unique solutions (Oshea & Madigan, 1997, p. X). Given this information, it becomes reasonable to view the advice of consulting companies on this matter skeptically. To address the tough questions on efficiency and effectiveness of ICTs, researchers are exploring how technological developments interact with communities and organizations from sociological and ethnographic perspectives (see Pinkett & O'Bryant 2003, Wakeford 2003, Wenger 2004a and Wenger 2004b). These researchers are working to address how to evaluate and develop ICTs that add value for the individuals within the community. Although each of the researchers approach the issue of value creation in different ways, all situate the application of information at the individual as apposed to the organizational level. This is a fundamental shift in context from researchers such as Kaplan and Norton (2004) who suggest that knowledge is a commodity that is made available to community members (rather then being created by them).

Perhaps one of the greatest difficulties in approaching the question of what role ICTs should play within community practices involves developing an understanding of different ways in which a community can be supported. In this chapter we assume that the application of information to relevant situations results in the creation of knowledge. As this information influences others through their participation in the process of learning, the community develops a more or less unified view of the world. This perspective is incompatible with Kaplan and Norton's perspective of knowledge as an organizational asset (although knowledge is not viewed as an asset, that does not mean that information is necessarily openly shared or unprotected from outside access). Knowledge that

emerges from the application of information through the daily practices of a group needs to be supported by technology differently than information that is to be applied for control and management of future actions.

> “Through BCcampus educators receive development funds for creating online learning resources, access to a shareable online learning resources (SOL*R) repository, training and dissemination of best practices, and support for communities of interest.” (Paul Stacey, 2007)

If we are to accept that knowledge is what communities have accumulated over time to understand the world and act effectively in it, then those who form the community membership must also actively manage knowledge that is created (Wenger, 2004(a), p. 230). Knowledge management systems (KMSs) can be viewed as nothing more than a set of tools used to aid individuals in communication, supplying information that may be used by others when considering problems that seem similar in nature. In other words, KMSs provide an alternative medium for individuals to view and contribute to the practices of a community.

Design Considerations

If ICTs are to support individuals and their contributions to the organizational learning process, then community members should become active participants in the design of these new technologies; individuals must begin asking questions about technical system designs and the way in which our communities are located within their production and use (Wakeford, 2003, p. 230). The involvement of individuals to guide the use of technological resources becomes more than just a question of matching business processes to system design and implementation principles, individuals within the community where these systems are being applied must accept the constraints and limitations that are used to regulate behaviour within this digital space.

The regulation of our behaviour, however, is only viewed negatively as a form of oppression when this regulation violates our social values. In fact, our fierce desire to protect and defend our national values provides a source of strength that we should use to create a digital environment that reflects our interests as independent organizations and Canadian citizens. As such, fundamental design criteria should address questions of intellectual property, free speech, privacy and security, in a manner that reflects the values of the collective digital community—and perhaps the Canadian society generally.

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9.3.4: Technical Investigations

Platforms, Applications and Services

Addressing the role of information within cyberspace provides understanding for the rationale behind the design of ICTs such as knowledge management systems. To transition between the design of ICTs as a concept and the implementation of ICTs within the world of digital technology, we must establish a foundational understanding of the processes that occur in computer-to-computer interactions.

To begin this discussion, we must start with a computer. We tend to think about computers as those appliances that sit below our desk at home or office where we can check email or perhaps create a CV. In fact, the definition of a computer can encompass a huge variety of technology from Internet enabled cell phones to massive PBX (private branch eXchange) systems capable of supplying telephone service to over 20,000 users. The ability for computers to interact is based on the open system interconnection (OSI) model (or in a simplistic version referred to as the TCP / IP protocol stack).

An understanding of how computers interact does not necessarily require a detailed technical understanding of the underlying technology. It is important to understand, however, some basic terminology. First, the platform refers to the collective ability of software and hardware to provide general lower level and nonspecific functions for the user. One function of a platform is to allow for outputting data. On home computer systems, for example, the Microsoft Windows operating system enables the user to print information, or save it on disc. This functionality is provided by a combination of hardware and software that together is referred to as your (computer) platform.

Applications are directly tied to your platform. These applications provide the platform with the ability to provide task-specific functions by structuring the way the platform processes and presents data. Internet applications are designed to access information from the Internet in a defined manner. Microsoft Outlook, for example, is an application that is designed to send and receive digital mail. This application can access the functionality of the platform to display, store, or print the mail that has been received.

Web-based services provide data to applications in a format that is not dependent on the platform of the individual user. The ability to communicate between two computers is based on: the standardization that has occurred within the transportation of data across the physical network infrastructure, and the establishment of a common language (HTML for example). That is to say that standardization has created the ability to establish communication (through standardized packets sent by the TCP / IP protocol stack over network cabling) and communicate coherently (through sending and receiving HTML, XML, or other data).

Once computers have established communication, web-based services provide data for a specific application (the Skype Internet telephone service provides communication packaging through the voice over Internet protocol). The application is responsible for interpreting this data and sending it to the platform for processing. The platform then presents this information to the user in the appropriate format (based on the computer's configuration). The Skype application, for example, would send and receive data from your Internet service provider and your computer platform, providing voice communication over the Internet through a headset and microphone.

Referencing and Recording Information

The independence of web services from platform-specific architecture can provide the ability to connect inherently different technologies. This ability to cross boundaries within system architecture, however, is not inherent in the technology. The technology has no inherent nature at all. The use of standardized communication packaging in no way requires the use of standardized languages. In fact, the ability to alter the way in which the computer interprets data is now a fundamental part of web services.

Altering how computers interpret data provides value by giving the application a structural context from which to view data that is received. By allowing the computer to maintain a specific and individual perspective, exploring complex relationships can be accomplished with greater efficiency. In the computer world, this individual perspective is based on a set of defined rules that allow the user to structure and reference information (much like colour-coded file folders and tabs are used to organize business information within a filing cabinet).

The explosion of new technology over the past twenty years has provided software developers with an overwhelming variety of tools for technological development. A quick tour of the computer section of the local book store will reveal volumes of books on C, C++, C#, Perl, Python, and PHP for programming; HTML, XML, XSL, and CSS for presentation / mark-up; and Flash, Illustrator, and Photoshop for graphic manipulation just to name a few. Each programming language has been used to create

applications that store, retrieve and/or present information. Although a detailed review of these concepts is beyond the scope of this chapter, the information that follows will provide a valuable resource in this endeavour.

The technology infrastructure and management processes can provide information on the current state of organizational knowledge. Although measures for evaluating organizational knowledge would be imperfect at best, it would provide system administrators with the information to make system design decisions based on behavioural patterns. (Integrating process management tools with design models will be covered in greater detail later in the chapter). Once patterns are recognized, system functionality can be developed based on these patterns. From this perspective, internal referencing not only determines how individuals navigate through a computer application, if designed correctly, referencing can provide continuous feedback for identifying changing patterns of behaviour.

Referencing

While referencing, applied within an organization, can provide insight into managerial practices, sharing this information externally can be accomplished by creating policies regarding access to this information (and enforcing these policies through system design). The creation of policies can ensure that direct and indirect stakeholder interests have been addressed when distributing organizational information. Aside from the policies related to the management and use of information externally, the technical process that makes this communication feasible must also be considered.

Referencing and exchanging electronic data effectively requires locating and describing data efficiently. Describing data helps the user or program determine relevance, while structuring the data allows the user or program to locate the data quickly. Once located, relevant data can be recorded (saved to disk or printed), linked (bookmarked for direct access to web pages for example), or distributed (data can be published within web pages, through subscription news feeds, or printed and given away). Efficient access to data through referencing provides extraordinary power and potential within a networked environment.

Because of the large amounts of data available, accessing it efficiently has become increasingly important.. Several types of structural formatting rules have been established and are publicly available to developers for review. Examples of these structural formatting rules include document type definitions (or schemas) and older electronic data interchange (EDI) formats. These formatting rules are evolving and refining standards as developers build new features and capabilities into communication frameworks such as the eXtensible markup language (XML).

One reason that the XML framework has been enthusiastically adopted stems from its ability to structure information in a flexible manner, allowing information to be grouped into related sub-topics. This grouping is especially useful when relating complex information between various computer applications. Unlike hypertext markup language (which formats data), XML can be used for situating data within a hierarchal structure.

For example, the data “Jenn Arden Brown” would use HTML markup syntax (… Jenn Arden Brown) to present the data in bold and italics: Jenn Arden Brown. XML markup would provide the semantic information (or field name in database terminology) used for adding context to the data using the following syntax:

```
<name>
    <first>Jenn</first>
    <middle>Arden</middle>
    <last>Brown</last>
</name>
```

In this case, the data can be integrated into both internal and external applications (assuming the data structures exist). For example, Microsoft Outlook may recognize XML structured data from a cellular phone application and automatically offer to store the data located within the <name> node (and subsequent <first>, <middle>, and <last> nodes) into your list of personal contacts.

Recording

Referencing locates and describes data for computer applications. Recording is used to store data between references. Perhaps the simplest way to record data is through printing the data onto paper, creating a physical copy that can be filed away, faxed to outside offices, or published on information boards. In the age of digital information, however, the amount of data available makes printing impractical for storing large amounts of information.

Printing was used historically for the storage of all data required by physical machines during the infancy of the computer industry. Printing, as the predominant form of data storage, became outdated with the ability to reliably store information onto tape and disk technology. These three technologies are not completely dissimilar. Each requires information to be packaged and stored in a linear format. In fact, linear packaging of information (or serialization) is still the predominant method for recording information today. Image files (such as JPEG, BMP and MPEG), office documents (such as Word documents) and static HTML web pages all store information in a linear format. It is the responsibility of the application (web browser, photo editor, word processor) to read these files from start to finish, process the data, and present the information in a manner that can be understood by the user.

Although at a fundamental level all information within a computer is stored in a linear format, advances in computer applications have provided greater flexibility in the packing and unpacking process. The ability for applications to process data is determined by their ability to apply specific rules during this process. Photo editors, for example, can usually interpret JPEG, BMP, and GIF images. These file types use standardized rules for presenting images. These rules can be incorporated into applications that are designed for the Microsoft, Linux, or Macintosh operating systems. Applications such as Internet Explorer, Photoshop, and GIMP (Gnu Image Manipulation Program) read the files from start to finish, apply rules for interpreting the data, and display the result to the user. This process works fine for relatively small packages of data. Reading the entire contents within a file, however, quickly becomes impractical when searching large amounts of data (for example, you would not want to read a complete dictionary each time you needed to define a single word).

Because of these limitations, the ability to structure data began to evolve. One method used to structure information into manageable subgroups is to organize the data into horizontal rows (records) and vertical columns (fields). Using this structural format, it becomes possible to search through data that meets certain characteristics (such as all individuals with the first.name value of Jenn). This technique for structuring data is referred to as a database.

Previously, the XML framework was used to describe how information can be referenced between computers. Although XML does not store data, which is physically stored in a linear text file, XML is a data model that can provide hierarchal structure. To clarify this, we revisit the previous XML example:

```
<name>
    <first>Jenn</first>
    <middle>Arden</middle>
    <last>Brown</last>
</name>
```

The data within this example is encapsulated within the tags <name> and </name>. In XML syntax, these tags can be described as opening and closing tags. In this case, the XML syntax references the node <name>, references the child node <first>, and inputs the data: Jenn. To externally reference (or exchange) this XML syntax with a database, we merely need to redefine how the computer application interprets the information. A database would interpret the XML syntax as follows:

First	Middle	Last
Jenn	Arden	Brown

Within a database, additional rows (termed records) can be used to describe a long list of people. When reading this database, the application can search only the ‘last’ field within the ‘name’ table and present only records with the data ‘Brown’ within this field. Searching within a single field reduces the amount of data that requires processing by applications. A relational data model, such as a database, requires that all records contain the same number of fields. Conversely, the XML data model is hierarchical, allowing unused nodes to be omitted. This differentiation will be explored in greater detail when technology development is discussed later in the chapter.

Organizing

We live in a hexi-deminal world, a reality where meaning is conveyed through characters (written and spoken) and numbers (pure and applied).

General numeric expressions like (3 x 2) or (3 + 2) can be used to help organize content [(6 people in 2 groups of 3) for example]. XML and related technologies (XSLT, XPath, XPointer) do not validate and/or execute more complex exponentiated functions.

However, exponentiated functions [(2 to the power of 8) or the (square root of 64)] are generally excessive for organizing information into a coherent and flexible format easily read by humans.

In short, XML technology provides a fast and flexible data framework / model with an ability to transport complex and deeply encoded files for additional processing (like streaming video). This technology can be seen in practice in the virtual world Second Life where XML—Remote Procedure Calls provide complex social and visual interactions (like dancing, talking and flirting).

Although database standards like ODBC lack certain flexibilities, they are adept at defining strict relationships between data sources. These often complex relations are valuable when referencing and processing a large number of records. New initiatives (by QD Technology in particular) have shown that queries can be sent and processed (using standardized ODBC compliant instructions) with compiled database sources. Although there are still graphical limitations, this marks a significant development in the organization and portable distribution of content.

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9.3.5: Splicing the Information Cable

Just as raft guide trainees are faced with both social and technical challenges that must be addressed before guiding difficult whitewater rapids, so too must members of digital communities overcome social and technical barriers when contributing to online practices. Given these challenges, proper sequencing of content becomes an important component of facilitating community interactions. The following section addresses issues associated with the sequencing and facilitation of community interactions, the publication of community information,and the development of technological infrastructure that supports these ongoing processes.

Developing Technology

With the Palm, PocketPC, and Blackberry handheld computers struggling for market share against both notebook computers and cell phones enhanced with text messaging and digital photography, the push to provide consumers with better information management tools and applications is not surprising. Manufacturers are competing fiercely to guide, or perhaps monopolize and control, the adoption of technology created by exponential growth rates in processing and data transmission capabilities over the past four decades (Technotopian Delusions, 2005[54]).

Although these applications are often designed around the commercial interests of private firms, technological standards are working to integrate these disparate information sources. The eXtensible markup language (XML) is one such standard, playing an increasingly important role in this ability to exchange and integrate application data. Through the development of industry-specific document type definitions (DTDs), system developers can clearly define how information is extracted from structured XML documents and used in new software applications.

As the complexity of information systems increase, system architects and information technology professionals have begun to develop sophisticated tools for modelling and communicating these intricate system designs (termed unified modelling language [UML] notation). Although practical examples of UML notation will be given in the following section, it is important to note that development of this notation closely follows the growth of object oriented programming practices that encourage code reuse through clearly defined and independent program modules.

The technical advancements that allow for the distribution of information over the past decade—accomplished through standardized referencing and recording practices—are often highly structured and inflexible. These information systems have largely modelled organizational structures found within small companies that benefit from centralized control, usually associated with niche expertise. As a result of these referencing and recording practices, many organizations suffer from hierarchal communication channels and myopic management, and are usually not able to respond to rapid changes in business conditions (Bieberstein et al., 2005, p. 696). For this reason IBM researchers have adopted a new form of organizational structure termed the “On Demand Workplace”. This new organizational structure provides the framework for redefining our increasingly “organic organizations” and strive to optimize the efficient exchange of information.

One method for efficiently exchanging information is by transporting data files using the hypertext transfer protocol (HTTP)—reliable message patterns (RMP). RMP is ideal in a networked environment. RMP provides transport of serialized content where distributed services can use XML-specific mid-tier processing.

Service oriented architecture

Frank Cohen suggests that service oriented architecture (SOA) is ideally suited to the loosely structured and decentralized communities emerging on the Web (FastSOA, p. 5). One tool available to the implementation of the service oriented architecture (SOA) implementation is the XML data model. Effective sharing between groups can be accomplished through policy enforcement regimes that use XML schema repositories (XSRs). Through XML referencing and recording of data, and effective sharing of information between groups, SOA can help define the relationship between the user and the software application.

Flexibility, rapid development, and good scalability can be encouraged with the adoption of: a common notation (UML), and a defined data model (XML). In its most basic form, SOA is a technique for component software reuse (FastSOA, p. 84). The SOA design pattern is well suited to update data aggregation services and perform complex federated service requests (Fast SOA, p. 65). This task is not easily achieved in more structured languages such as SQL.

Simple object access protocol

Mid-tier processing is used to address the difficulties that arise when flexible XML technology is merged with a relational database management system (RDBMS). Common techniques for mapping data from XML files to database storage systems use the simple

object access protocol (SOAP), which “allows us to pass structured, typed data in a decentralized, distributed environment” (Lecky-Thompson et al., 2005).

The SOAP—remote procedure call (RPC) uses exponentiated encoding to map XML data structures to data objects located within trusted memory resources allocated to programming languages. As a result, “SOAP-RPC bindings instantiate up to 15,000 Java objects to deserialize the SOAP request that contain 500 elements in the SOAP message body.” (Perkins et al., p. 274).

The complex auto-binding ability that maps XML content to database storage (XML-RPC) should be used sparingly as files over 96kbs can have a dramatic impact on CPU and network bandwidth (FastSOA, p. 69). Alternatively, XML documents can be encoded literally, using SOAP-document-literal-encoding. SOAP-document-literal-encoding, however, does not allow you fine-grained control over the data source from Java.

Java and the Enterprise Java Bean

> EJB stands for “Enterprise JavaBeans” which are distributed network-aware components for developing secure, scalable, transactional and multi-user components in a J2EE environment. (Sun Microsystems, 2007)

Java and PHP are both programming languages. Languages have advantages over document parsers when supplying complex mathematical and functional routine libraries. These libraries send requests for computer processing resources. For Java languages, this request is created within a Java container. The container often used for Java server page content is Project Catalina (Tomcat). Tomcat runs these libraries by establishing a trusted set of memory resources on the computer platform.

Trust is established within Java by using defined functional components as described by the Technology compatibility kits (TCK) developed through the Java community process (Dmitry A. Fazunenko, JDJ, p. 26). These technology compatibility kits (TCK) are distributed using the XML data model. TCKs ensure that vital information is distributed for the conformance testing of components such as the Enterprise JavaBeans (EJB), and are available upon subscription from Sun Microsystems.

The trusted memory resources restrict Java from accessing external resources. EJBs provide access to those restricted resources. This access is secured through highly defined relationships that coordinate and facilitate the transmission of information between the programming language and networking infrastructure. In other words, Enterprise JavaBeans can be described as a set of components that help to define a collection of properties (classes) and access points (interfaces) used to enhance interaction between the system and user.

LearningTimes, a web application, is one such example of a Java based community application. This application is built on open source (CommunityZero) technology and uses highly structured database technology distributed across multiple servers and multiple locations to offer secure, scalable, and reliable services.

XML document parsers

Data can be referenced, recorded, and organized using less complex and more flexible tools available in nativeXML document parsers such as the document object model (DOM), streaming API for XML (StAX), or Java architecture for XML Binding (JAXB) to name just a few. XML document parsers work alongside your webserver (Apache, IIS, Lighttpd [Lighty], Cherokee) to organize data using arithmetic operators (addition/subtraction and multiplication/division) without the processor-intensive mathematical libraries available to Java, Perl, Ruby, or Python.

Although a detailed explanation of document parsers is beyond the scope of this chapter, the above document parsers provide access to objects from within programming languages. Each of these processing models offers alternative design patterns. Design patterns provide structure to application program logic. As such, “the structure of a program should mirror the structure of the data that it processes” (Kroenke, 1992, p. 274). Stated another way, XML document parsers should be selected based upon; 1) the data structure within the XML data model, and 2) how that data will be used by the programming language. Table 19.2 provides a brief description of where the XML parsers mentioned above offer performance advantages:

XML Parsers	Description
Document Object Model	Suited to situations where all elements within the data structure need to be evaluated.
Streaming API for XML	Suited to situations where skipping unwanted sections of the data structure provides performance advantages.

XML Parsers	Description
Java Architecture for XML Binding	Suited for referencing large elements within the data structure where both control over the serialization process and validation as a set of properties (classes) by the Java Language are required.

Once formed, XML documents can be filtered and displayed. One tool for altering the style of XML content distributed online is the “XSL Specification, which lets you translate XML tags into other XML tags” (Sun Microsystems, 2007). These transformations can occur as a result of the native-XML parser’s ability to ‘close’ the data model; ensuring the algebraic constructions are created in a logical manner.

One advantage of using XML document parsers is their ability to distribute data collection processes to mid-tier application servers. By transferring data collection processes to community led groups, complete authority over what data is created and how data is organized can encourage new and creative forms of contribution, greater coordination and alignment of efforts, and broader engagement in community discussions and initiatives. Community groups often use a variety of methods to publish content, including wikis, blogs and RSS feeds.

This authority to manage information within the community is critical in supporting the production of knowledge. When knowledge has been created through the application of information to relevant situations, a unique community perspective emerges.

At this point, the knowledge obtained by the community can be transformed and given structure by defining a document type definition (DTD). This DTD is the foundation for sharing community practices between various groups and sub-groups. Policies for sharing this information are then enforced through a validation process that is applied through XML schema technology. As the community develops these DTD and broader engagement in community initiatives occur, a variety of policies can be created and enforced using an XML schema repository.

Interacting with Technology

So far we have tried to explain how the computer references and records information, using logical arguments and examples. Though these concepts are important to understanding technologies implementation, communication frameworks such as XML are rarely described as intuitive.

Perhaps it is this lack of intuitive understanding that constrains the adoption of technology within society, manifesting itself as a growing digital divide between demographic and social groups within communities. This division has concerned industry leading experts in ICTs for over a half century, but only recently have these concerns emerged as urgent and worthy of careful study. Today, with technology imposing on every aspect of daily lives, new initiatives, studies, and research have undergone explosive growth, resulting in the plethora of tools and applications designed to support the adoption and adaptation of technology and information.

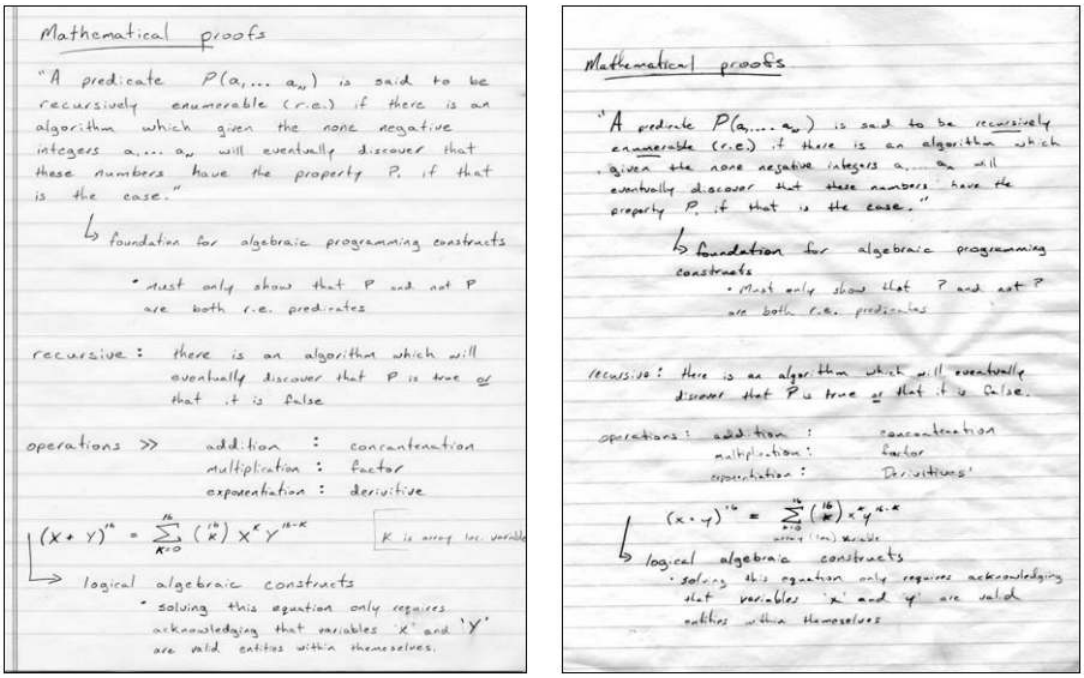


Figure 9.3.5.1: Notes on Algorithmic Information Theory by Chaiten (1987). Written by Shawn Berney (2005).

Publication

With the emergence of Internet in the home a mere decade ago, its presence has transformed communication, entertainment, and research.

Although economic and business principles have adapted to accommodate electronic commerce, perhaps the greatest impacts associated with the Internet occurred when “technology had collided so violently with journalism” (Gillmore, 2004, para. 19). This collision forever altered how individuals contribute to the community consciousness, creating “a conversation in which the grassroots are absolutely essential” (Gillmore, 2005, p. 50).

From the humble roots of hobbyist bulletin board systems that supported text-based games, electronic messaging, and file sharing, conversations began to develop into communities. These communities, frequented primarily by local individuals (due to the high cost of long distance phone service), began to thrive. Today the need for community planning initiatives is more important then ever before. “Aggregation is the name of the game, driving users away from search engines with a flat and bulky model of the net into the arms of specialist groupings and community-led sub-nets” (Howse, 2005). As the expectation of individuals to both access and publish information grows, greater demands have been placed onto administrators for features that allow sites to quickly and easily update site content. Today a wide variety of applications are available for publication, providing everything from photo galleries to real-time collaboration of complex documents and projects.

> “However, inasmuch as a monthly newsletter contributes to a community rhythm, a ScoPE community blog (in the works!) would provide more timely updates. A blog does not reach the same audience as a community newsletter, so we are investigating ways to produce and manage both.” SCoPe Case Study, written by Sylvia Currie
>
> “The Small City site allows for daily/weekly/monthly email notices of content updates and more recently a RSS feed has been added to help push communication about these activities out so that those interested in participation are made aware and can choose to participate if they want. All these are ways in which we are attempting to foster participation.” Small Cities Case Study, written by Dan O'Reilly

Enhancing community

The abundance of technology has changed the lives of Canadians. Some researchers suggest that through open trade policies and the reduction of the barriers associated with adopting new technology, efficient distribution of information can be encouraged (Hoekman et al, 2004). Other researchers argue that, through targeted intervention, this information can be used to create new forms of learning and community practices. Though the analysis of trade policies may provide valuable insight into economic development of digital communities, we will focus here instead on the development of community learning. From this perspective,

facilitating the integration of new information may provide insight into the manner in which individuals contribute to community practices, leaving the issues of personal and community economic development issues aside. If you are interested in this topic, there are several articles within the References section worth reading.

Facilitating the learning experience

Researchers have been increasingly addressing the complex issue of learning within a technologically diverse and complex social environment. Wenger (2004b) suggests that:

> "The challenges that we face today can be understood as learning challenges … [and] all these challenges require accelerated learning at multiple levels of scales at once, from individuals, to communities, to regions, to the whole world. But such deep and multi-scale learning is not simply a cognitive challenge; it entails a transformation of our very identities".

Provoking reflection and interpretation of new information supported by technological infrastructure can transform the way we engage with the world. Wenger suggests that these "complex situations where everyone belongs to very large numbers of different communities over the course of their lives and at any given time … [shows that] each person is a unique intersection of multi-membership" (Wenger, 2004b, p. 5). By leveraging this multi-membership and reifying the relationships between individuals, IBM researchers suggest that contributions to information management practices can reflect the dynamic and flexible nature of human interaction.

Conceptually, Wenger suggests that the reason human interaction is dynamic and flexible is founded in our ability to negotiate new meaning and incorporate that meaning into our community involvement and identity (2004b, p. 5). Through facilitation, it may become possible for individuals to benefit from key factors that researchers such as Wenger suggest are critical within all communities of practices—providing stimulation to the learners' imaginations, aligning and coordinating of efforts between individuals, and engaging individuals in new practices (1998).

As technology continues to develop towards supporting newly created and dynamic teams, perhaps the facilitation of technology could benefit from group leadership and development skills. Techniques for developing these skills have been ingrained into the operational practices of leadership development and training centres such as Outward Bound and certification programs such as the Association of Canadian Mountain Guides. The following sections highlight selected techniques for developing these group leadership skills.

Facilitation techniques

Although group facilitation techniques are varied, adventure guiding researchers have identified several structural features that encourage behaviour that meets group expectations. These structural features include the group focus of activities, the use of metaphoric processing, and exposure to unfamiliar environmental conditions (Newes, n.d.). By manipulating these structural features facilitators can alter the amount of cognitive load required by participants, thus reducing stress and mental fatigue (Fabrizio & Niell, n.d., p. 6). While discomfort can initiate personal growth and development, substantial time and interaction must be provided. The proper sequencing of events and content can provide participants a natural progression towards full community participation and help individuals avoid potentially severe negative reactions that can result in social withdrawal.

If the individual adapts to the stressful new conditions the discomfort is temporary, and increases self-esteem and perceived competence. To expedite this process, expectations should be realistic. Faciliated discussions can create an atmosphere of trust, cooperation, tolerance and integrity.

Within digital communities of practice, unfamiliar environmental conditions often challenge new participants of group oriented activities. These participants can easily become overwhelmed by new terminology and technological processes. Facilitating new information through techniques such as debriefing exercises, front-loading community activities, and metaphoric examples framed within a similar context (termed isomorphic framing) may help participants adopt, and adapt to, community information.

The use of facilitated debriefing provides the participants with the opportunity for active reflection and open communication following group activities. These debriefing exercises may address specific behaviour or, more generally, provide direction and help prioritize future initiatives. Debriefing is commonly used to facilitate a greater understanding of complex or stressful events to ensure that individuals comprehend and recognize a broad community perspective.

Alternatively, activities and events can be addressed in advance by highlighting common perceptions or actions and suggesting alternative behaviours. Front-loading community activities can be advantageous when attempting to avoid specific recurring and undesirable behaviours within community interactions. Front-loading community interactions can also be combined with isomorphic framing to provide subtle guidance relating to community expectations.

Sequencing

Developing strong interpersonal communication can also be supported through carefully designed and sequenced interactions. Just as facilitation requires specific and well timed intervention, participant development can be aided by well structured and implemented opportunities to engage community participants in the accomplishment of broad based group goals and objectives. These opportunities can be presented as valued components that require attention within the digital community. Using this methodology, participants have the freedom to specialize in areas of personal interest defined within the community, while community facilitators and educators support these contributions by integrating this information into community practice and conceptual understanding.

Carefully designing and planning alternative / candidate activities for community participants can also create sub-groups based upon experience and expertise. These sub-groups can provide valuable support as individuals experience discomfort, stress, and frustration related to new and unfamiliar practices. In turn, these unfamiliar practices will become more routine and individuals will begin to participate more fully in community practices.

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9.3.6: The Architect …

> “I have come to the conclusion that software architecture is very difficult to define. It is a range of artifacts that are used to specify the strategic decisions about the structure and behavior of the system, the collaborations among the system elements, and the physical deployment of the system” (Quatrani, 2003).

While the previous sections focused on the sociological and technical foundations for building digital communities, this section works to address how these ideas can be integrated into a digital community’s social fabric— its code. This section is dedicated to exploring tools used by software developers to communicate the complex relationships within digital communities. A basic understanding of these tools can increase the value and functionality of these emerging collaborative spaces. The tools can provide powerful working documents that encourage input from the diverse community members who populate these digital communities.

The system architect collects and analyzes software requirements then documents the required functionality for both the end user and the application. In an effort to standardize the communication of these complex relationships, system architects have begun to adopt notation techniques based on the unified modelling language (UML).

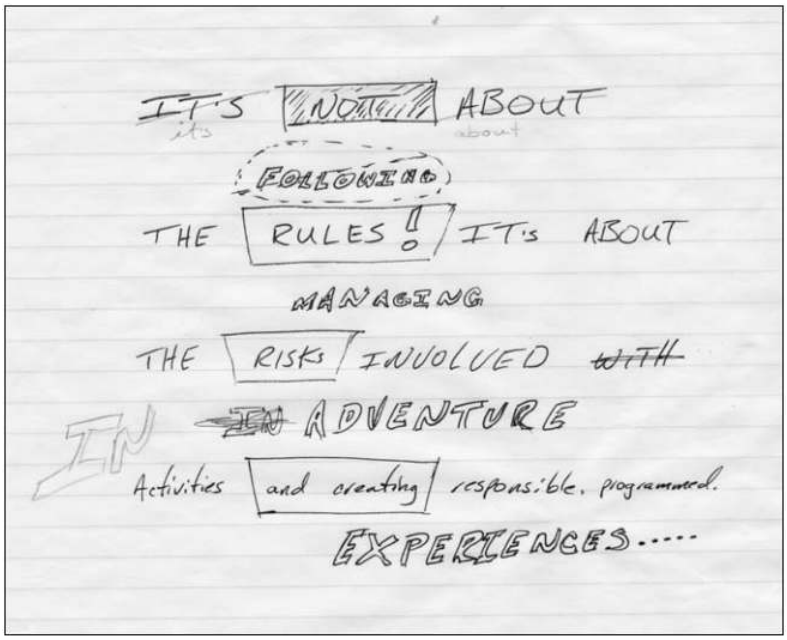


Figure 9.3.6.1: It's Not About … Created by Shawn Berney (2005)

UML provides an abstract representation of complex relationships. This notation can be used to extend the efforts of social and technical investigations by providing a flexible and powerful communication framework. UML is a compilation of primarily three common, yet distinct notations (including OMT [Rumbaugh], Booch & OOSE [Jacobson]), and is now a fully recognized and published standard (ISO/IEC 19501:2005) within the International Organization for Standardization (ISO).

System Modelling

Structuring information is critical in facilitating highly dynamic and complex interactions. For raft guide trainees, structure is provided continuously through direct supervision. This instruction and supervision provides guide trainees with valuable feedback and insight into community practices and expectations. This feedback allows guide hopefuls to develop and contribute to the completion of a safe and enjoyable rafting experience. By clearly communicating how raft guide trainees can contribute to the professional rafting community, trainees can offer valued contributions without imposing on the guests’ experiences.

Rafting companies provide much more than professional guides; they provide a carefully choreographed series of experiences designed to educate and entertain. The services must work to attain the highest quality guest experience.

The experience attained within a digital community can also be viewed as a series of choreographed and sequenced interactions. These interactions are influenced by both the architectural design of the digital community and the services provided by information managers during the implementation of the system architecture. The development of modelling tools have been

successfully used to mediate these complex relationships, allowing individuals to communicate important system design information, system implementation processes, and the sequences and activities available for facilitating participation.

Use case diagrams

> "The most important role of a use case model is one of communication. It provides a vehicle used by the customer or end users and the developers to discuss the system's functionality and behavior." (Quatrani, 2003).

Describing how users will interface with highly structured computer information systems is an important and complex task. Developing technological infrastructure that efficiently models community practices requires a detailed understanding of how community members interact. Individuals with this knowledge are often referred to as domain experts. These experts are frequently charged with attempting to explain complex and informal information management practices. Use case diagrams are designed to visually represent these practices, capturing information that allows system architects and software engineers to ensure new technological solutions record and reference valued information only.

Activity diagrams

> "These diagrams represent the dynamics of the system. They are flow charts that are used to show the workflow of a system; that is, they show the flow of control from activity to activity in the system, what activities can be done in parallel, and any alternate paths through the flow … activity diagrams may be created to represent the flow across use cases or they may be created to represent the flow within a particular use case … Activity diagrams may [also] be created to show the workflow for an operation". (Quatrani, 2003).

Once the required information has been identified, system architects begin to evaluate the process for collecting and publishing the information for community access. Once again, domain experts—those individuals familiar with community practices—play a vital role in explaining the information requirements of community members. In this stage of system development, documentation provides insight into community participation by identifying the actions of community members. Ideally, these actions will be developed using a series of modular and reusable components.

Sequence diagrams

> "A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams typically are associated with use case realizations in the Logical View of the system under development". (Quatrani, 2003).

Once the program activities have been identified, software developers work to sequence the completion of these activities. Sequencing activities facilitates community participation by defining opportunities to engage in group goals and objectives. By carefully selecting how information system architecture imposes constraints upon community member interactions, digital communities can create carefully choreographed experiences.

Class diagrams

A class is an abstract representation of an idea (an approval class for example). Class diagrams are commonly used by software engineers to provide an abstract representation of programming logic (the connections between ideas, for example, ensuring approval status is obtained before allowing publication to occur). Programming logic is used to implement a technological solution that reflects the process of storing (recording and referencing) and retrieving (publishing and facilitating) digital information. Class diagrams also allow programmers to communicate the technical ability for software to integrate additional features or third-party modular extensions, an important component of implementing a SOA strategy.

The Application of UML

By sharing the process used to integrate new technological infrastructure, digital community practitioners can begin to selectively evaluate architecture found within various software packages. When this evaluation process is combined with community consultation, development initiatives can be prioritized and system integration requirements can be clearly defined.

The implementation process

These communication tools can be combined to create a solid process for managing the information lifecycle and provide insight into the design and development of community infrastructure. The ability to derive processes from the business information model (such as UML diagrams) can be used to map information interaction patterns and facilitate the adoption of content (Hinkelman,

Buddenbaum & Zhang, 2006, p. 375). Existing data structures can be mapped and information transformed to enable data exchange between disparate information systems—a process “strategically important for enterprises to increase information technology efficiency be reusing and integrating existing [data]” (Roth et al, 2006, p. 393).

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9.3.7: Summary

The development of technological infrastructure that supports community interactions has seen explosive growth with the emergence of high speed and wireless Internet access. As these tools continue to develop, and tools for integrating disparate information sources become increasingly sophisticated, digital communities have the opportunity to expand and grow. To enhance this growth, greater community involvement in the planning and design of community infrastructure can be used to evaluate the barriers associated with participation. Visual modelling tools are merely one tool that can support this ongoing process of community consultation and development.

Visual models such as the UML notation techniques can help to educate community participants on how information is managed. These tools can also provide important insight into community design initiatives; allowing productive discussions about issues such as privacy, security, intellectual property, and architectural design to occur.

For the greatest community value, it is important to understand how society is being altered by digital technology. Working to inform community discussions can aid participants in understanding digital community design alternatives. These discussions should strive to include real world economic and financial considerations; allowing individuals to invest greater amounts of time and energy into digital communities.

Once individuals begin to invest time and effort into community initiatives, information managers must work to facilitate contributions to community initiatives and develop sequenced candidate plans that support community priorities. The ability to plan and structure digital community development using modelling techniques will allow new ideas to emerge and encourage the coordination and integration of new technological initiatives continually over time.

> “The first guiding value in hacker life is passion, that is, some intrinsically interesting pursuit that energizes the hacker and contains joy in its realization”. – Pekka Himanen, The Hacker Ethic, p. 139

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10: Module 10- How can we create positive learning environments?

By Karen Jordan

Introduction

Why do children in today's classroom like or dislike school? How can a child have confidence in his ability to learn? What motivates a child to learn? An enthusiastic teacher can create a positive learning environment that will give a child a positive attitude toward school. He will be motivated by interesting learning experiences and strive to meet his potential because there is an enthusiastic teacher that sees the value of his contribution to the classroom family. The teacher is the thermostat that will control the classroom climate. The elements of a well-planned physical structure, effective behavior management and the caring teacher will blend together and create a positive learning environment.

Physical Environment

According to Konza, Grainer & Bradshaw (2001) in their book, Classroom Management: A Survival Guide explains that the physical environment within a classroom is an indicator of your expectations as a teacher. Before the school year begins, the foundation for the class must be established by the physical arrangement of the classroom. The first step in establishing conditions for learning and preventing behavior problems is to create an orderly setting. “The physical environment can influence the way teachers and students feel, think and behave.” (Stewart, Evans, and Kacyzynski, Winter 1997, p. 53). A classroom that has an aesthetic appearance and is well organized can have a positive effect on student behavior, allowing for more frequent and quality teacher-student interactions without excessive noise or disruptions. (Stewart, Evans, and Kacyzynski, Winter 1997, p. 53).

The first thought in arranging the classroom is to make sure the teacher's desk is located with a bird's eye view of the classroom. The desks should be arranged to promote learning, and consideration should be given to the inclusive classroom. Analyze the specific activities you will incorporate in your lessons and design areas for this purpose, and when possible allow students to help decorate these areas. Designate an area of the classroom to display the student's work. All age groups like to see their work displayed. (Stewart, Evans, and Kacyzynski, Winter 1997, p. 53). Other options for classroom decor are to creatively post classroom rules, the students assignments and emphasize a new unit or new skills. Bulletin boards are another key area for decoration. They should be should not be cluttered, but attractive, and changed frequently. Plants are another means to make the classroom environment aesthetically pleasing. (Nevin, Knoblock, 2005 p. 19).

Behavioral Environment

Chris Johnson has stated that the Chicago Fire Department spends 80% of their budget on the prevention of fires. They spend less than 20% of the remaining budget putting out the fires. Prevention is the key to a controlled classroom environment (Meyers, 2007, p. 22). From the very beginning of school, the teacher needs to establish the leadership roll.(Meadows, Melloy, Yell, 1996, p. 124.). Start by setting up the routines the first month of school. Get to know the students—who they are, their interests, and what kind of learning experiences are motivating to them (Meyers, 2007, p. 22).

From the very beginning, the teacher must establish what she expects from the students. “Rules: This is your opportunity to set yourself up for a year of happiness, or a year of grief-the decision is yours” (Meyers, 2007, p. 22). The rules should be brief and specific, presented in a positive manner, and limited to five or six important rules (Meadows, Melloy, Yell, 1996,.p. 124). They should not be just listed and recited; instead, create a special assignment for each of the important rules you want to emphasize . Build “student ownership and include students voices and input. Finish the lesson with a follow-up that encourages students to think about, discuss and reflect upon the need for the rule in their classroom (Meyers, 2007, p. 22)”. Once the rules are established and understood, it is crucial that the consequences are enforced consistently (Meadows, Melloy, Yell, 1996,.p. 124).

Classroom behavior is also directly related to the teacher's structure of the class. Effective classroom managers are aware of what is taking place in the class and maintain student involvement (Meadows, Melloy, Yell, 1996, p. 124). The attention of the students is increased by repeatedly giving clear instructions and keeping the pace of the instruction moving as rapidly as the class is capable. Appropriate assignments, feedback and making smooth transitions between subjects will help the students be more attentive during class. Another element that is crucial to the structure of the classroom is positive reinforcement. Given consistently, students are motivated to choose appropriate behavior. Wise choices for positive reinforcement would be positive notes and phone calls to parents, rewards, extra privileges and meaningful praise (Meadows, Melloy, Yell, 1996,.p. 124). A teacher that is effective in creating a positive learning environment will “act more than react.” Meadows, Melloy, Yell, 1996, p. 124).

The student that creates behavior challenges for the teacher can pose problems within a positive environment, since it does not solve all problems. In my own experience, I have had a difficult child that was diagnosed ADHD and oppositionally defiant. This was only the beginning of the student's symptoms. The child was a first grader and yet could not remain in his seat or sit quietly. It was not unusual for the child to be redirected to his seat 50 times in a single day. I decided to try giving this student freedom to move as he needed by creating a large boxed area with tape and giving him two desks approximately six feet apart within that space. He has freedom to move around as he needs, but he MUST stay within his box. To help with his talking out, his voice must remain in the box as well. I provided the student with his own trash can, water bottle, pencil sharpener, and extra puzzles to occupy him during transitional times in class. This has proven to be highly effective for this student, reducing the number of redirections to his seat to approximately eight times, but what works for one may not work for another. The point is that a teacher needs to be creative in an inclusive classroom.

Emotional Environment

It is the teacher who establishes the climate for the classroom. An enthusiastic teacher can supply motivation for students in a positive learning environment. “Stimulating teaching has been described as entertaining, motivating, interesting, and thought-provoking (Nevin, Knoblock, 2005 p.19).” A teacher's attitude affects how children perceive school. She should have high expectations of their students and believe they are all capable of learning (Stewart, Evans, and Kacyzynski, Winter 1997, p. 53).

Note

Enthusiastically Create a Positive Learning Environment and Build a Positive Relationship with Students (Nevin and Knoblock, 2005, p. 18)

Smile, laugh, show emotion, and a passion for learning. Greet students personally. Engage students in activities will ask them to share their personal experiences. Switch tasks to frequently and encourage more experiential styles of learning in class. Acknowledge positive behavior and use language that is positive. Avoid embarrassing the students. Keep good eye contact and use humor. .

Every child has a need for acceptance and therefore the teacher needs to have a good relationship with each of the students. A teacher that focuses on the individual needs of each of the students will enthusiastically adapt the instruction to the various learning styles and at the same time make special provisions for diversity (Stewart, Evans, and Kacyzynski, Winter 1997, p. 53).

Conclusion

A positive learning environment in the classroom is possible with an enthusiastic teacher that builds a personal relationship with the students. Preparation must begin before the first day of class. The foundation needs to be laid from the beginning with the establishment of the rules that are consistently enforced throughout the remainder of the year. The teacher must be structured, conscientious and vary the lessons according to interest, learning styles and diversity. The enthusiastic teacher that has created a positive learning environment has a classroom that is motivated to learn.

Exercise 10.1

1. The key to a controlled classroom environment is:

A. An aesthetically appealing classroom

B. Prevention

C. Negative Reinforcement

2. The _____ establishes the climate for the classroom.

A. Principal

B. Students

C. Teachers

3. An effective classroom manager is aware of what is taking place in the classroom and will

A. Maintain student involvement.

B. Have mirrors strategically placed.

C. Place the desk in the front of the classroom.

4. One way to instruct the students of the classroom rules is to:

A. Write the rules 10x each.

B. A group classroom project.

C. Recite the rules daily for a week.

5.A(n)_____ can supply motivation for the students:

A. treasure box

B. enthusiastic teacher

C. firm discipline system

Answer

1. A
2. C
3. C
4. B
5. B

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10.1: Issues and Challenges in Educational Uses of Social Software

ISSUES AND CHALLENGES IN EDUCATIONAL USES OF SOCIAL SOFTWARE

Turning and turning in the widening gyre The falcon cannot hear the falconer; Things fall apart; the center cannot hold; Mere anarchy is loosed upon the world,

W. B. Yeats, "The Second Coming"

In this chapter we explore some of the risks and dangers of using social software. We have touched on some of these already in our discussion of each of the social forms, and in our stories—out-of-control feedback loops, privacy, identity, safety, reliability, access, usability, and a host of other issues have emerged in the context of the tools, methods, and systems we use in social learning. In this chapter we focus on issues that arise within an institutional education context, rather than in purely informal and non-formal learning, because many problems are a result of the clash between novel adjacent possibles and the baked-in norms, methods, and behaviors that have evolved in a different evolutionary landscape. The fact that you are probably reading this as a book rather than a more socially mediated form demonstrates that we are in a period of transition, where old ways of thinking and learning are overlaid on and co-exist with the new.

Disruption and Change

Institutions seldom accept with relish major changes to practice, especially those that impact long-held norms and beliefs, and resistance is common. C. Christensen observes that disruptive innovation, of the sort we are observing here, is almost never successfully developed and adopted within existing systems (1997; Christensen et al., 2008). This is not surprising, because disruptive innovations are nearly always initially worse than the existing systems with which they compete. Most technologies evolve primarily by assembly, slowly gaining in complexity and sophistication. Only rarely do novel innovations come along, and when they do, they are nearly always less compelling, functional, or useful than what they replace at first. As Arthur (2010) explained, it was around twenty years before jet engines were able to compete with their piston-driven propeller forebears, and at first, they did so in separate, non-competing niches. Educational systems may be viewed as complex adaptive systems, and like ecologies, novelty rarely survives unless the evolutionary landscape changes or they are introduced from a different ecosystem.

Disruptive innovations can therefore only take root where they are allowed to incubate without direct competition with existing technologies. Christensen cites the growth of microcomputers which, he claims, initially targeted children and gaming systems in order to establish a market where they could evolve without clashing head-on with the monolithic mini- and mainframe computers that already had the adult market well sewn up. Net, set, and collective technologies used in learning have evolved outside the educational system in social networks, Q&A sites, blogs, and wikis, filling niches not already taken. Some, at first, crept into the educational system unbidden and are hardly noticed as they sow seeds for change: Wikipedia, the Khan Academy, and other social systems present faces sufficiently similar to existing models that are the thin end of a wedge to prise open educational systems to new technologies.

Net, set, and collective-oriented social technologies for learning, as we have seen, demand a different way of thinking about the learning process than those built for groups. The whole apparatus of institutional learning, including the processes and methods used in schools, universities, and colleges, is a highly evolved set of technologies that does what it aims to do very well. Social technologies designed to support net and set modes of interaction, when placed in direct competition with other tools such as purpose-built learning management systems built to fit with the other technologies of education, will likely fare poorly. In particular, there is a mismatch between the technologies of institutions and those of network, set, and collective-centered social systems. Technologies such as classes, timetables, hierarchical management, assessments, lesson plans, and teacher-oriented pedagogies are unlikely to be well catered for by tools that center on individuals and networks. This puts a brake on change and progress. It is exacerbated because existing systems such as Moodle, Blackboard, and Desire2Learn are highly evolved monoliths that perform a wide variety of functions and are purposely incorporating a growing number of tools that, superficially, look like network tools: wikis, blogs and similar features are increasingly included in such systems. However, though the tools may look and act in a similar manner to their counterparts in the wild, the group-based teaching that they are intended to support changes them. They use the same tools, but they are different technologies with different purposes, utilizing different phenomena with subtly different functionalities. Moreover, they are combined with different assemblies, and it is the assemblies that matter more than the parts of which they are comprised. Wheels appear in many different technologies, but it is the cars, watches, boats, cookers, and doors that matter to us, not the fact that they all contain wheels of some sort. It is the same for blogs and wikis: simply providing a tool as part of an assembly does not necessarily make that assembly into a different kind of social technology.

If we are to make effective use of networks, sets, and collectives within an institutional setting, then the greatest impact will be achieved by supporting needs and interests not already catered to by a well-evolved and entrenched set of tools. Potential niches within a formal setting include:

- Inter-/cross-disciplinary learning (e.g., support for using common research tools, cross-course projects, etc.)
- Learner-driven (as opposed to syllabus-driven) pedagogies
- Beyond-the-campus learning (incorporating others beyond the institution, whether formally or informally)
- Beyond-the-course learning, supporting disciplinary activity and interest across cohorts
- Self-guided research
- Self-organizing groups (e.g., study groups)
- Just-in-time learning
- Enduring committees, clubs, and student organizations
- Peer support (e.g., for learning to use research tools, computers, etc.)

Institutional Cross-cutting Cleavages

One of the first issues typically raised when a social software system is proposed that empowers students to share with others relates to dealing with posts that are critical, abusive, illegal, or objectionable—especially if the system allows public viewing beyond institutional boundaries. However, we have rarely experienced anything like this, either at Athabasca University or the University of Brighton.

Tens of thousands of posts have been created, almost none of which caused problems for others or threatened the institution, and none, so far as we know, included intentionally malicious or harmful material. Far from it: for the most part, public posts have served as an advertisement and invitation, something to be proud of, not hidden. We do, however, acknowledge the harm caused by bullying, especially in school systems.

Perfectly legitimate posts, taken out of context, can be offensive or disturbing for others using the system. Most university courses in the arts and humanities actively encourage students to explore complex adult issues and, in many cases, be provocative. In the comfort and safety of a role-controlled, group-based LMS, such posts are read by others with an understanding of the context, course requirements, expectations and norms. When this moves into a network, or worse, a set mode of engagement, posts that are made visible beyond the group might be seen out of context and may not be understood or may be deemed offensive by others. Discipline boundaries may make this more difficult to address. For instance, a religious student who is using a social media system as part of her course and treats it as an extension of the classroom—a safe space, a functional tool—especially if she objects to, say, swearing, may not appreciate a work of art posted by a student of fine arts deliberately constructed with profanities and blasphemies to challenge sensibilities. Some respond to this kind of problem with a knee-jerk reaction of censorship, asking for tools to hide such things, while others suggest self-censorship or tutor regulation of activities, but that denies the point of the provocative piece in the first place. Such anomalies are rare but important, affecting the beliefs, opinions, feelings, and relationships of individuals within a social system. This relates closely to the problem of contextual ambiguity.

Contextual Ambiguity

Within an institutional setting, learners are constantly switching between different groups, networks, and sets, in a far more diverse and discontinuous manner than, say, when engaging with a social network of friends or people in similar businesses. A single tool that supports group, network, and set modes of interaction can soon become an unwieldy and confusing space unless it has been carefully designed to take these discontinuities into consideration. Traditional learning management systems, being group-oriented, carefully divide spaces into well-defined, course-oriented segments. Social networks base their design models on the assumption that a single individual has a single network, a single persona, a single facet that is displayed, with more or less filtering, to others. Some systems, such as Elgg, Google+ or, in an inelegant way, Facebook lists, explicitly recognize the discontinuous nature of networks and offer support for filtering different content to and from different people, but these are simply filters: the underlying presentation of content does not vary, it's just that some people see more than others, and some content is preferentially displayed depending on its originator. One very common way to get around this problem is to use different tools for different groups, nets, and sets. However, this raises important issues: it becomes significantly harder to maintain and for users to master, especially given the fact that groups, nets, and sets often overlap with one another in multiple dimensions, so similar lists of the same people may often recur in different systems. It also raises the specter of duplicate functionality.

We have created a range of solutions in Elgg for the problem of contextual ambiguity clustered under the umbrella term of "context switching"(Dron et al., 2011). The tools allow anyone to switch between different social and personal learning contexts, and to

show different things to different people in different ways. Tools include tabbed profiles, dashboards, and group profiles, which allow an individual or a group to organize their learning life into separate spaces, each built with highly configurable widgets. These spaces may have different appearances and display quite different content and, crucially, may be visible to different people. The circle-like collections that allow people to create sets of networks make this highly configurable: people can reveal what they want to reveal, how they want to reveal it, and to whom they want to reveal it too easily and fluidly. Different dashboards can also be configured to make navigation and retrieval easier as a user switches from task to task. We have added many different widgets that make it possible to show fine-grained results not just from personal content but also from networks, groups, and sets that are of interest. We have also created a "set" tool that enables people to group collections of related content together so that they can more easily represent different interests and identities to different people.

"Duplicate" Functionality

One of the largest problems that we have faced in encouraging uptake of the Landing at Athabasca University is that it is perceived to offer little that is different from other systems in use at the institution. This is a valid concern. It is, for example, possible to use email to replicate almost anything that can be done with social software, from a discussion forum to an LMS or social networking system. However, the complexities of doing so for anything that departs from one-to-one or one-to-many messaging are immense, requiring a great deal of effort, interpretation, and coordination by people involved in the dialogue, and slowing the pace to the extent that, for many uses, would be highly impractical. For email to be a shared repository, for example, every recipient would have to keep a copy and organize it in a way that would make it easily discoverable when others refer to it; in contrast to the simplicity of sharing a web page or link to an online repository, this is clearly a poor approach. The same is true of many tools, especially when they provide rich toolsets. For example, an LMS may offer messaging (like email), chat (like an instant messenger), wikis, blogs, discussion forums, bookmark sharing, file sharing, and many other tools duplicated in social systems. Conversely, Facebook may provide many tools that are similar to or improve on tools provided by an institutional LMS. The toolsets that we use for different networks such as LinkedIn, Google+, Facebook, Bebo, Hi5, or MySpace may offer very similar functions to one another, or subsume others. Most systems have Twitter-like microblog variants, for instance. However, quite apart from the different networks and sets that inhabit these spaces, there are very few cases where systems are drop-in replacements for other systems. All have some differentiating value in terms of access control, role systems, aesthetics, usability, price, manageability, tools, long-term prospects, support communities, capabilities for integration, and so on.

Faced with a potential infinitude of alternatives, it makes no sense to choose them all. This is especially true of social systems, where the fact that someone is using one system may act as a disincentive to use another, and make it pointless to do so: if everyone in the world were using a different, non-interoperable social system, then they would not be social at all. In an ideal world, tools would be interoperable so that one could be integrated with any other, and any community could extend its tool use in any way appropriate to the social form. Where possible, such interoperable, mashable, and connectable tools should be used. However, real-world decisions seldom provide this luxury. Apart from the ability to use tools together, there are few general rules for making decisions about which to choose. We have found our framework of social forms very useful in establishing criteria and heuristics for selecting appropriate technologies. For example, our selection of an Elgg system was due to the lack of support within Moodle for set and net modes of engagement. However, this left us with many further choices to make. We list a number of weighted criteria here that may be useful to others faced with similar decisions, but it should be borne in mind that the context of every decision of this nature will strongly determine important factors, and this is far from an exhaustive list:

- Cost
- Support (internal and community/company)
- Potential longevity
- Control (personal, and at group level)
- Usability
- Accessibility
- Import capacity
- Export capacity
- Interoperability with other systems
- Device support
- Learnability
- Diversity of tools
- Scalability
- Hosting (local, cloud)

- Access control and role models
- Network/set/group features

We encourage those who are trying to decide whether to implement social tools in their learning, and which to choose, to extend and amend this list to fit their own constraints, interests, and contextual concerns. When selecting the technologies for the Landing, we gathered stakeholders together and asked them to contribute the things they wished to see and what they wished to avoid in the new system: our list was many times longer than the one presented here. Every sociotechnical context will be different and should be dealt with on its own terms.

Privacy and Social Software

Many a parent has been shocked by the personal disclosure exhibited by their children on networked social software sites. Do they really want the whole world to see the pictures or read about their antics at last weekend's beach party? Will they want those images retrieved in ten years, when the not-so-young person applies for a new position or runs for public office? The affordance of cyberspace to provide and in some senses become a personal newspaper, radio, and television station broadcasting 24 hours a day to a global audience raises very profound questions about privacy, openness, and identity. The persistence of digital data on a network, and the fact that it may be seen in a very different context from its original posting, makes this a pressing concern. For many of us, the Net forces a profound rethinking of privacy and public identity. Privacy issues have likely been of interest since prehistoric times, when we shared our caves with others. The advent of both mass and personal communications has served only to speed up and magnify these concerns.

In his ground-breaking work, Altman (1976) noted the interest in privacy from many discipline perspectives shown by citizens, social institutions, and governments. He lists three ways in which privacy is defined and understood. To some, privacy revolves around exclusion, the avoidance of others, and keeping certain types of knowledge away from others. A second definition focuses on control, individuals' abilities to open and close themselves to others, and the freedom to decide what aspects of themselves are made accessible to others. Paradoxically, privacy is not defined merely by the presence or absence of others, as is implied in the sense of being anonymous or "lost in the crowd." Likewise, privacy is not valued in and of itself: it is relative to changing needs. An ultimately private life might look like a sentence of solitary confinement in jail, or being shipwrecked on a desert island. Finally, privacy is not static: each of us has moments when we desire both more and less of the presence of others, and similarly, there are times when we want to share more or less of ourselves and our ideas. Thus, Altman's second definition, with its focus on privacy as choice and control, suggests we need mechanisms that allow us to control the boundaries in time, space, perception, and communication so we may selectively open and close ourselves to both general and particular sets of "others."

Altman also describes the systems, tools, and behaviors we use to create, defend, and appropriately modify our sense of privacy to align with our everchanging needs. He notes three types of boundary tools. The first use verbal and non-verbal behaviors: we invite others to enter or to leave our individual spaces. The second is built upon on environmental constraints we build and inhabit such as doors, fences, and speaking platforms. Finally, Altman notes cultural constraints, such as the type of questions that are appropriate to ask, the loudness of voice, and the amount of physical touch we use to build and reinforce interpersonal boundaries that culturally define privacy spaces and practices. Each of these boundary behaviors has evolved over millennia and been finely honed by evolutionary selection. The Internet, however, has evolved with breakneck speed, and has created privacy concerns with which we have had little experience, nor enough time for us to evolve appropriate boundary tools and systems.

Palen and Dourish (2003) invite us to unpack our concepts of privacy for a networked context . They note that "with information technology, our ability to rely on these same physical, psychological and social mechanisms for regulating privacy is changed and often reduced" (p. 130). If we return to Altman's three sets of boundary tools, we see that each is fundamentally altered by network affordances. Verbal and nonverbal behaviors certainly change in networked contexts, and their diversity, from text messages to immersive interaction with avatars, makes generalizations challenging. Most notably, networked behaviors span boundaries of time. A Google search reveals not only the comments I made this week or last, but reveals my comments from years past. Given that the boundaries I use to protect and define my privacy comfort zone are ever-changing and context-dependent, it is important that I know who threatens these barriers, so that I can raise the appropriate level of boundary protection. Unfortunately, such awareness of others is often not possible on the Net. The searcher of my name can easily be a trusted colleague, a potential new friend, an aggressive salesman, or an identity thief. Furthermore, the audience changes over time. Trusted colleagues one year may become aggressive competitors the next, and information that I may be proud to share this year may prove highly embarrassing in the years to come. Worse still, the place where I left private information may change its privacy rules and technologies without me being aware of this. Many users of Facebook, in particular, have suffered because of the network's ever-shifting privacy controls that have often revealed more than they originally intended to different people.

Environmental boundaries also are morphed in cyberspace. All but the most tightly encrypted activity in cyberspace leaves traces. Many Net users use multiple email addresses and maintain multiple identities in immersive environments and open social software sites so that they can contain these traces. Passwords, access to members and friends, and other security tools replace locks and keys from the physical world but fill similar functions. And just like in the real world, locks, doors, and barriers require active maintenance and attention to adequately serve as boundary defenders.

The cultural boundaries are perhaps most profoundly altered in networked contexts. There are as yet only emerging standards and social norms that are acknowledge and adhered to by Net citizens. For example, many of us have different standards with regard to email functions such as use of blind copies, forwarding messages with or without approval, and the release of our own email addresses or those of others. In even newer contexts such as SecondLife, World of Warcraft, and other immersive environments, social and cultural practices are constantly evolving and altering, and currently these customs change while millions of new users are exploring these environments.

We see that the maintenance of privacy and the boundary tools that we use in the networked world are in many ways markedly dissimilar to those we encounter in real-life contexts. Thus, it should come as no surprise that privacy issues are a major concern for all who use the Net, and perhaps especially so for those using social software tools for both formal and informal learning.

Many social software suites allow users to set privacy controls on personal information, permitting them to effectively select the amount of disclosure they allow and to what audience this information is revealed. However, studies are showing that the majority of users do not alter these privacy settings, leaving the default settings of the system (Govani & Pashley, 2005). In a 2005 study at Carnegie Mellon University of over 4,000 students registered on Facebook, Gross and Acquisti (2005) found “only a small number of members change the default privacy preferences, which are set to maximize the visibility of users profiles” (p. 79). Govani and Pashley (2005) found that over 30% of university students in the US had given permission for people they had never met to be their “friends” on the popular social networking site, allowing these strangers access to their entire profile, containing contact information, photos, and other personal details. As awareness of the dangers increases, however, users are becoming more careful. A US-based Pew Internet Study in 2011 revealed that 58% of adult users of social networking sites limited access to only friends, 26% of them adding further access controls, and another 19% making them partially private (Rainie & Wellman, 2012). Even so, this still means that 23% of users make no effort at all to control their privacy.

It is interesting to speculate on the reasons why users are not more actively constraining the visibility of private content. This is likely not because of a lack of awareness about the problem, given the coverage in the popular press on issues related to identity theft and cyber-stalking. In a 2007 qualitative study of Facebook users, Strater and Richter found that “while users do not underestimate the privacy threats of online disclosures, they do misjudge the extent, activity, and accessibility of their social networks.” (2007, p. 158). The participants in this study did realize that posting personal information could have negative repercussions, but they assumed (often incorrectly) that such data was only accessible to a selected group of trusted friends. One might also wonder about the user-friendliness and design of social software tools. It may not be clear to users exactly who has access, and perceived as difficult to restrict access further. But what is more likely is that those users realize the value of social software increases in proportion to their support for connections with new and current friends and acquaintances. The balance is always a trade-off: many social software systems provide their services in return for information about individuals.

Taken to its logical conclusion, those most concerned with privacy would not participate in social networks at all, and indeed, this does happen—we have relatives who avoid all but personal communication online. Thus, we can assume users need very flexible systems that allow them to hide and reveal information at a low level of granularity, both in regard to the nature of the information and the membership of the various audiences who are allowed access to it. These decisions are very personal, and defy generalizations based on socio-demographic details. For example, the authors release their cellphone numbers only to a small group of very close friends and family. Yet for others, their mobile number is very public knowledge and is listed in many places on the Web just as many home phone numbers appear in paper-based telephone directories even today. We also provide information to select and changeable audiences. For example, we might share our calendars with associates at our workplace, but would withdraw this if either we or our colleagues left our current place of work.

Privacy and Teachers

The mismatch between the social forms of classroom groups, with their formalized hierarchies and social networks and sets, has led to many difficulties for teachers, especially in schools. The formal relationship between teacher and student causes difficulties for some when teachers disclose information about their personal lives, reveal preferences and interests outside the professional context of the classroom, and engage in social chat with students. Indeed, recognizing this mismatch, the makers of Facebook provide explicit advice on separating the formal context of the teacher from the networks of their students (Dwyer, 2009). We

understand that the formality of teacher–student relationships can lead to difficulties in a network context that, in extreme cases, lead to teachers losing their jobs, or at least their credibility in the classroom. Many teachers deliberately refuse to accept “friend” requests from students and former students for this reason. On Athabasca Landing, we deliberately renamed “friend” as “follower” in order to address the fact that there are complex ethical and practical issues for some teachers and students treating one another as friends. However, the corollary to this issue is that a blurring between student and teacher networks can allow richer, longer-lasting, valuable relationships. By enabling students to see their teachers as human beings, warts and all, they can gain a clearer idea of what it means to be a lifelong learner, to see that education is not divorced from life but is an integral part of it.

The notion that teachers should be role models is deeply embedded in the way the profession is viewed in society, but we question the value of a role model who demonstrates secrecy, and by implication, hypocrisy. We believe that teachers should present themselves as they are, not as they should be. Institutional values need to be seen in a human context, not as aspirational rules but as lived behaviors. This is not to suggest that teachers should reveal every aspect of their private lives. Context matters, and some things are rightfully kept private from some people. But the notion that the solution to the problem is to keep everything secret to the extent that we reject personal connection with those we teach is taking secrecy too far, and represents a failure to embrace an adjacent possible that can greatly enrich the learner experience.

Why do People Disclose?

“Several objects motivated blogging in our sample. Bloggers blogged in order to:

1. Update others on activities and whereabouts.
2. Express opinions to influence others.
3. Seek others’ opinions and feedback.
4. ‘Think by writing.’
5. Release emotional tension.” (Nardi, Schiano, & Gumbrecht, 2004, p. 225)

The previous sections reveal that the control of privacy is a challenging and ongoing task. Effective management must work at a number of levels and entails a partnership of software designers, ethical and attentive systems managers, and knowledgeable and empowered users.

The design constraints of this context focus on three challenging propositions:

1. There is no single control setting that meets both the privacy and dissemination needs of all users.
2. There is no single control setting that effectively both secures and exposes all of the components of my personal profile and contributions or postings I wish to share.
3. There is no single setting or control that effectively both secures and exposes information over an extended period of time, since users’ needs are subject to change.

The first constraint leads naturally to the solution that each individual should be able to easily set the privacy controls over personal information. While such a solution works for informed adults, it presents further challenges when educational social software systems are used by children who require either institutional or parental guidance.

Linked with concerns about privacy, and in some sense predicating them is the notion of online identity. Increasingly, we establish a range of online identities across social networks, on the websites that we visit, in our email systems, and in the online group tools we use. Despite efforts to consolidate identities through systems such as OpenID, Facebook Connect, Twitter, or Google+, those who choose to engage with cyberspace have to deal with multiple ways of revealing identity across different contexts. Our own context-switching approaches are one way to deal with this (Dron et al., 2011), but the bulk of solutions involve using different social systems and tools for different purposes.

Trust

Beyond issues of privacy and identity, networks and sets (in particular) raise issues of trust and security. We have already observed that one of the most significant issues driving the use of collectives in networks is to establish faith in the credentials of those with whom, and from whom, we learn online. The popular press is full of examples of ways that trust can be broken online, notably in the behavior of some pedophiles and other stalkers in cyberspace, who take advantage of the many-to-many strengths of the Internet combined with the potential for anonymity to achieve nefarious ends. While we hope such problems are rarely present in learning communities, it is vital to their success that learners feel safe and secure when learning. Learning outcomes are far more easily achieved if, in particular:

- One trusts the skills and capabilities of a teacher, both in subject matter and in pedagogical abilities

- One feels safe from attack or lesser antagonism by one's peers

Learning is, by definition, a leap into the unknown, and the unknown is scary. While we may justifiably be scared by what we know is harmful, what we don't know is often scarier. It is a sensible evolutionary adaptation that makes us fearful or wary of dark places and novel situations: until we gain awareness of the potential risks, it is safer to assume that danger may be lurking than that there is no danger at all. This is only true up to a point, of course—risk avoidance also means opportunity avoidance, so it is more an issue of being wary than of not doing anything that might be dangerous. It is also true that many of us positively relish the tingle of fear that comes when starting a new learning trajectory, the thrill of uncertainty that comes with learning something new, but again, only up to a point. This is perhaps itself a learned behaviour, something we have come to recognize as a result of previous successful experiences, probably with the kind of assistance and safety that a teacher provided, even if we have now learned to teach ourselves.

One of the many roles played by teachers and teaching institutions is to provide reassurance and a measure of safety. This is an essential process: if the only way we had to learn how to swim, perform surgery, ride a bicycle, or hunt a wild animal were to actually do so in real life, then far fewer would survive the process. Any child who has learnt to swim by being thrown in at the deep end is unlikely to have a very comfortable memory of the process, even though it might have been tempered by an underlying trust in the one doing the throwing. While learning about medieval history, how to be a teacher, literary criticism, or how to play the piano may lack the risks and dangers of the previous examples, there can still be fear involved, if only of failure to achieve our learning goals.

Whatever the risk factor of our learning is, nevertheless, it is helpful to be led by one who we believe knows the paths. We need teachers not just because we can achieve more with the aid of an expert—remember Alan Kay's warnings about the danger of a "chopsticks culture," when learners are provided with technologies but no examples from which to learn (1996)—but because the expert reduces uncertainty and/or reassures us about what we do not know, and offers us the security of knowing someone will be there to catch us when we fall. Similarly, if there are fellow travelers, we usually want them to, at the very least, not wish us harm in achieving our goals. We need supportive fellow learners not just because they help us to explore perspectives, including our own, but because they reduce the danger. We generally feel more comfortable when entering an unknown place or situation if there is someone else we know and trust with us.

All of this leads to some interesting problems in networked learning. We have seen that collective approaches can help in establishing trust, but when learning and engaging with others, it is the purely human and social processes of communication that we fall back on. Different cues in what people say can help: it is usually obvious, for example, when someone is being provocative, flaming, or trolling. Equally, it is generally clear when someone is using dialogue to be supportive and helpful. Unfortunately, when the former has occurred, it may poison us against a particular community or network, reducing our willingness to participate. We, the authors, have experienced some responses to our thoughts and discussions on the subject of this book in a networked environment that were discouraging, infuriating, or just plain useless or irrelevant. Partly we are supported by each other, partly by a belief that the medium is worth persisting in, and partly we have been inured to such things over many years of participation, but it is easy to see how such experiences might dispirit someone feeling uncertain and insecure. Indeed, if it happens often enough, it may prevent them from wanting to participate at all in any network.

This is a larger problem than it might be in a closed group context because our networks are typically joined and borderless, so withdrawal from one network may mean withdrawal from others. To make matters worse, there are subtler problems than simple antagonism. People may use a network as a platform to discuss things that do not interest us, get sidetracked by things we consider irrelevant, or simply talk at a level that is either beneath or above us, leaving us feeling alienated or bored. The very diversity that gives networks much of their strength also, potentially, contains the seeds of their demise. Much of the work that we have performed in the area of context-switching and context awareness has been an attempt to reduce such dangers by allowing people greater control of how and what is disclosed, and with whom it is shared.

Access Issues and the Digital Divide

Although access to cyberspace is fast becoming the norm in both highly and less well-developed countries, the majority of people in the world still do not have access to an Internet-connected computer. This proportion becomes significantly smaller when we take into account those with mobile phones but, despite over 2 billion broadband-connected mobile devices, most cellphones used at the time of writing have limited access to the totality of cyberspace, and that still leaves billions with limited means to access even a small part of it, let alone the Internet whether for economic or political reasons. This remains the case despite the growth of services like U2opia (www.u2opiamobile.com) that bridge the gap by allowing Facebook or other service access through traditional

"dumbphones." The topic of mobile telephones raises a further concern that there is much inequality in access speeds and the capabilities of machines used to gain access to cyberspace.

What can be reached and how fast it can be accessed with a basic cellphone is far less than what can be achieved with a top-of-the-line laptop or tablet with a high-speed connection. The massive growth in such technologies seems set to continue for some time to come, but inequalities will still remain even when, by 2017, it is projected that a broadband connection will be available for almost everyone on the planet (Broadband Commission, 2013, p. 14). In the authors' own country (Canada), the majority of the population is at least able, if they wish, to gain high-speed access to the Internet, but even in this highly developed country, there are huge areas where dial-up or, surprisingly often, satellite access is still the only option available. This immediately discounts a wide range of the technologies we have written about, including VoIP telephony, videoconferencing, live web meetings, immersive 3D environments, and more, as well as making even common websites, especially those using rich media, Flash, or AJAX technologies, unbearably slow to access. Having said that, access to more basic technologies like books, desks, and even pencils remains an issue in many parts of the world, so the problem is not new. Moreover, while the costs of initial access remain relatively high and still beyond the reach of some poorer families, once a connection is made into cyberspace, the cost of networked information is typically much lower than that of traditional books (Renner, 2009).

At Athabasca University we are making the transition from paper to electronic books and have calculated that, even given publishers' often exorbitant textbook prices (whether electronic or on paper), the cost of a good e-reading device, whether a tablet or dedicated reader, will be offset after the purchase of two or three textbooks for an average course, while the cheapest tablets now cost significantly less than a typical textbook, and come with access to tens of thousands of free books from sites such as Project Gutenberg. Such devices offer more than just an alternative means of reading: they also provide access to the Web, email, and many other facilities of cyberspace. While many issues remain, such as the cost of network access, the availability of infrastructure, and the complexity of calculating environmental impact relative to the cost of paper, storage, and transport needed for books, the accelerating move to ever greater cyberspace access for an ever-increasing diversity of people seems inevitable for economic reasons alone. There are large economic and gender inequalities that must be overcome but we are already at the point where access to the Internet is more widespread than to a decent traditional education, especially at higher levels, and so we are optimistic about the future. We hope that the ideas we promote in this book, particularly as they apply to networks, sets and collectives, may suggest ways that learning can happen without a formal educational process, enabled by the massive growth in socially-enabled technologies that is bound to occur.

Mobile Learning

Mobile technologies offer many affordances. A modern smartphone is far richer than the average personal computer in its input capabilities (e.g., voice, video, velocity, direction, text, geo-location, Bluetooth, Wi-Fi, cellular networks, and more); even the simplest cellphones offer text and speech capabilities. Cellphones are typically with us all the time and smartphones allow us constant, uninterrupted access to cyberspace. At the same time, they have at least as many limitations as affordances, such as small screens, deeply incompatible standards, limited processing power, limited battery lives, expensive tariffs and overly diverse interfaces. With some exceptions, content developed for the Web needs to be re-presented for use on cellphones. Indeed, content and applications developed for one make and model of cellphone may fail to work on another, even from the same manufacturer. Despite the growth of popular platforms like iPhone, Blackberry, Windows Mobile, and Android, most applications will fail to work across even two of them, let alone all.

There are pedagogical challenges too. It would be wrong to suggest that the migration from traditional media to the Web was unproblematic, but it was a far simpler transition process than it now is from the Web to mobile platforms. Partly this was due to the fact that most uses of digital technology in education, as in other industries, do not show an imaginative leap when presented through a new medium: the typical LMS is a classic example of the "horseless carriage phenomenon," a mirror of existing face-to-face processes in an online environment, with little heed for the affordances of the medium. The small-screened, incompatible devices with awkward systems at best for text input do not succumb so neatly to mimicry, apart from some limited contexts such as language learning. As technologies such as Twitter Bootstrap (twitter.github.com/bootstrap/) that allow multiple representations of content for different devices become more prevalent, awareness of these issues is increasing and the tools to address them are more widely available.

Legal and Ethical Issues in Networked Environments

The global nature of networked environments poses a range of challenges to many of our legal systems in different countries, states, and provinces. We have seen in recent years a sharp reaction from governments to the increase in network freedom new

technologies allow. From the extreme black hole of North Korea and the censorship activities of China, to the subtler scrutiny and control of the US (as evidenced by the provisions of the Patriot Act), governments are becoming more active in controlling the use of the Internet by their populations. Even in relatively libertarian countries such as Canada and the UK, service providers are required to keep records of activities that may be scrutinized with, some would argue, insufficient concern for the rights of citizens.

Copyright (Cross Country/State/Province Concerns)

The increasing economic value of videos, blockbuster novels, and sound recordings has provoked governments to respond to pressures from their media and cultural industries to increase the length and enforcement of copyright protection for intellectual property. This has resulted in extensions of the exclusive but temporary monopoly granted to creators to market their intellectual products in many parts of the world. As a result, educators have had to wage extensive battles with copyright owners, who are often major for-profit publishers, rather than content creators, to assert their right to Fair Use of content for education and research purposes. Recently in Canada and elsewhere, the tide seems to be turning, and courts and legislatures are realizing that allowing dissemination, review, and critique in the education system actually enhances and stimulates the development of cultural and intellectual content, which was the original aim of copyright legislation.

Also of increasing importance is the capacity to lawfully share intellectual products while retaining some or all copyright, typically through various Creative Commons licensing schemes. It is a tragedy that so much potentially valuable educational content lies unused and unusable, not because educators or other creators want the product to be restricted from educational use, but because, prior to the Net and Creative Commons licenses, there was no cost-effective way to share it while retaining rights such as attribution, restriction from others commercially exploiting the product, or changing parts and then redistributing product.

Openness, Interoperability, and Integration

We should disclose a personal bias at this point: the authors of this book are strong advocates of open sharing of knowledge, and chose AU Press at least partly because it is committed to making its books available freely for education and non-commercial download. In a social learning context, a lack of openness can cause difficulties. For example, if a wiki has been worked upon by multiple authors, then ownership is hard to ascertain and the solution in a non-open context is often to default to that of the service provider—a university, publisher, or closed company. This situation both reduces motivation to contribute, because contributors do not have control of distribution, and prevents the free flow of knowledge. The issue becomes more complex when data are aggregated and re-presented, as may often occur when, for example, pulling in and redisplaying an RSS feed. There is a tension between personal ownership, the social capital that accrues as a result, and the sharing of knowledge that is essential for learning to occur.

The issue goes beyond simple questions of ownership, however. It is not quite enough that we own and share the data we produce: we also have to be able to re-use it, integrate it, and re-present it. For this, protocols and standards such as TinCan, OpenDD, Europass, RSS, and Atom are required to enable the easy movement of data from one system to another. Unfortunately, many proprietary systems are deliberately designed to make such transfers difficult. As is often the case, the dominant social software provider at the time of writing, Facebook, is one of the worst offenders: although user pressure has forced the company to allow people to export their own data, it is in a form that cannot easily be re-used in a different and potentially competitive social system. Facebook, Twitter, and other commercial systems often assert some degree of ownership over the content produced by their millions of users, and their business models are based on analysis and sale of “their” content. This is one of the reasons that boutique systems such as the Landing are valuable, because they make it possible to return ownership to users. However, efforts to do this on a larger scale, such as Diaspora, have failed to gain momentum so far.

Cultural Considerations

Despite a widespread feeling that we inhabit McLuhan’s global village, cultural identities remain strong. As with personal identity, we are typically not just part of a single culture, but engage in many cultures in many contexts. One of the most popular means of distinguishing differences in cultures comes from Hofstede (2001), whose study of a multinational corporation across 40 different countries revealed five distinct dimensions of culture. Of these, the dimension that showed most variation and has been frequently verified and observed in other studies (Church, 2000; Triandis, 2004) is the collectivist/individualist dimension. In individualist cultures, people see themselves as separate individuals and prioritize their personal goals over those of others, motivated by personal needs, goals, and rights—culture in the US, though diverse, provides a classic example of this set of behaviors, but it may be found in most Western cultures. In collectivist cultures, on the other hand, people see themselves as parts of “collectives” (note that this is not in the technical sense that we have used the term, but rather used in a more general social sense) such as families,

organizations, tribes, and nations. Their motivations are more closely aligned with those of their social aggregations, and are driven by norms, duties, and expectations of these groups, nets, sets, and collectives.

Indian culture, though arguably even more diverse than the US, provides a good example of a more socially oriented set of attitudes. Given the great differences between cultures in this dimension, one would expect significant differences in uses of social networks, and this is indeed what we find (Kim, Sohn, & Choi, 2011; Vasalou, Joinson, & Courvoisier, 2010). Even more significant, from a learning perspective, is what happens when people with divergent cultural attitudes inhabit the same virtual spaces. Many of these differences are masked because social groupings need to share a common language. But, increasingly, as English competencies are developed by citizens of all nations in the world, we expect to see more confrontations and misunderstandings resulting from differences in this collectivist/individualist dimension. This is particularly significant inasmuch as, to a greater extent than when meeting face to face, obvious signals that a person belongs to a particular culture may be less prominent or not be observable at all.

Social software is only part of a learning system: content, behaviors, norms, existing social forms, and many other factors play strong roles in determining the shape it will take. Because of the way that structure can determine or influence behavior, there is a risk that a social software system designed with one set of cultural expectations in mind may work against the dominant (or conversely, dominated) culture that uses it. Conversely, where a strong culture exists, it may undermine the effectiveness of software built to support different needs. Where, for example, as in India it is the cultural norm for teachers to be treated with a particular kind of respect (Jadhav, 1999), a system that deliberately equalizes participants in a learning transaction may cause discomfort to some or all participants.

Author Dron experienced this firsthand when working in a cross-cultural collaboration between English and Indian computing students in the early 2000s, where different norms posed a major threat to effective collaboration (Singh & Dron, 2002).

After trying and failing to encourage discussion through closed forums, at least partly because such exchanges were not the norm in India, a large part of the solution to this problem was to use a set-based, topic-oriented collective bookmarking application, CoFIND, that largely anonymized interaction and required little direct contact beyond cooperative sharing. By focusing on a shared topic of interest to both groups of students, many of the social differences and imbalances could be safely ignored, while both groups benefited from the process. This topic-oriented sharing was a common denominator that reflected common practice among students in India, where sharing of notes was common but challenging the wisdom of elders, including those within the student body, was frowned upon or caused discomfort. This was in almost total opposition to the more constructivist, guide-on-the-side approaches taken with the UK group, where argument and conflict were seen as part of the process. As a result, what little dialogue there was when these cultures were blended was stilted and strange. On a smaller scale, we have observed that cultural expectations of teachers by learners trained to stand up and bow to their professors can make for a similarly strange and stilted dialogue in an open learning environment like the Landing. The fact that some students, especially those from collectivist cultures, feel uncomfortable addressing us as anything other than “Dr. Dron” or “Professor Anderson” overlays a different kind of ethos to that of the casual, first-name culture we typically encourage and that students from more individualist cultures more often find easier to adopt. This tendency is exacerbated by the formal context of institutional learning that reinforces and sustains roles and hierarchies, regardless of the equality we deliberately encourage on the Landing. Like all cultural differences, there is huge variety to be found among individuals and a great deal of blurring between cultures, but the propensity of groups to converge on norms and develop groupthink behaviors means that such behaviors can spread in both directions. Whether this is a good or a bad thing depends on one’s perspective and the context of the group. On a good day, it can help to provide a sense of membership and commonality. On a bad day, it can clash with the pedagogies and processes intended to bring about learning, either by preventing easy sharing or by causing discomfort to those for whom such sharing may feel unnatural.

Lost Souls

Sherry Turkle’s book, *Alone Together* (2011), is a tightly argued warning against the alienation and increasing separation between people that cyberspace technologies can create. As we increasingly cease to engage in physical spaces, often preferring the convenience and controllability of SMS, email, messaging, social networks, and other forms of electronically mediated interaction, the breadth of our social interaction increases while becoming shallower, less engaged, less human. Our knowledge of others becomes what they choose to represent with avatars and profiles, abbreviated and edited, essentially a narcissistic performance where friendship is measured in quantity rather than quality. This is indeed a worrying trend, though Turkle’s arguments are diminished somewhat by studies that show those who engage more online and through mobile devices also spend more time in face-to-face interaction (Rainie & Wellman, 2012). There are also notable benefits for those who have found communities and engagement with others who would otherwise have found it difficult to do so (Wei & Lo, 2006) and huge benefits that Turkle

acknowledges in sustaining relationships at a distance (T. H. Christensen, 2009). However, even when active users of social media have extensive contact with others in person, that face-to-face time may not be full engagement. We have all sat in public spaces surrounded by others who are at once with us but also texting, messaging, and talking to people at a distance on cellphones and tablets. Whether or not we find this disturbing, for distance learners something is usually better than nothing. Without such technologies, many distance learners would be far more isolated than they are.

Information Overload

The ease with which information can be shared is both a blessing and a curse. In a formal course setting, students with who tutors might have had sporadic and formal contact in the past may now require or at least expect far more attention. One of author Dron's students, studying the "benefits" of social media in online learning, proudly proclaimed the effectiveness of her intervention by pointing to increased satisfaction levels, greatly improved grades, and deeper learning outcomes. On further investigation, the interview responses quickly revealed the reason for this. For instance, instant messaging was seen as especially useful because, according to one responder, "It was wonderful to be able to contact your teacher any time, even after midnight.

One of the greatest benefits of social media lies in their potential to create richer channels that let great teachers do what they do best. However, dedicated online teachers are rapidly drowning in a torrent of interaction where there are no longer quiet times of the day, no longer holidays or conference times when they cannot be contacted. Some have taken email sabbaticals, or specified online hours during which they will attempt to reply, but the torrent continues for most of us regardless of good intentions to constrain our availability to others. This is an unfortunate result of the combination of network and group forms.

The group form typically includes, as part of the implicit or explicit rules that govern it, the requirement for a teacher to be responsive and demonstrably caring. That expectation has, however, arisen in a controllable environment in which caring need only be evidenced during class and office hours. More network-oriented social media such as social networking tools, blog comments, and email increase both the volume of traffic and the expectations of a response: the many-to-one nature of the engagement can quickly overwhelm a teacher. It is essential for the network-engaged teacher to make response time expectations clear at the outset and, in designing learning experiences that incorporate the crowd, to ensure that there are opportunities (and expectations) for others to answer questions and discuss issues.

A similar problem afflicts the online learner. A popular connectivist MOOC can generate hundreds of posts a day, and sorting the wheat from the chaff can be a major problem. Collectives can help a great deal in this case, however, providing assistance in filtering and searching for dialogue.

Filter Bubbles and Echo Chambers

We have already written of some of the ways that the Matthew Effect and preferential attachment can lead to mob stupidity rather than wise crowds. The perils of groupthink, echo chambers in which we only hear what we choose to, and the blind leading the blind are particularly problematic in a learning context (Pariser, 2011). Network and set forms of engagement remove the comfortable assurance of accredited sages telling us what to learn and how, replacing it not only with the difficulties of deciding who and what to trust but also a set of dynamics that may actually make things worse by their very nature. In a formal learning context, it is therefore of vital importance that teachers challenge and refocus students who are led to low fitness peaks and into filter bubbles.

Conclusion

We have solutions to some of the risks of a networked learning environment, but many risks and uncertainties still remain. The greatest risks all come back to difficulties in understanding the nature of social engagement in social media. Excessive content is often a direct consequence of superimposing a network or set form on that of the group, without adjusting the processes and methods used by the group. Privacy concerns often occur as a result of misplaced assumptions in a closed group, when in fact the social environment is net-like, or worse, set-like. Alienation and separation occur when people mistake Net-enabled interaction for relationships in meat-space (i.e., the non-cyberspace "real world"). Shifting contexts become hidden in simplistic, one-dimensional models of identity provided by many networked social environments. Collectives, used uncritically, are as likely to lead to stupid mobs as they are to wise crowds, perhaps more so, and the dangers of filter bubbles creating echo chambers where vision becomes narrow are great. We hope that the clearer understanding of social forms we have provided in this book will help networked learners and teachers to at least be aware of the risks and be more mindful of the ways that they engage. These issues will continue to emerge as technologies develop in years to come. With that in mind, in our final chapter we move on to discuss current and projected innovations that are currently emerging, providing new challenges as well as exciting opportunities.

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CHAPTER OVERVIEW

11: Module 11- Promoting Internet Safety for K-12 Students

11.1: Social Learning Theories

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11.1: Social Learning Theories

SOCIAL LEARNING THEORIES

He who loves practice without theory is like the sailor who boards ship without a rudder and compass and never knows where he may cast. Leonardo da Vinci

In this chapter we provide an overview of the major learning theories that influence the development of social learning activity, culture, and research. For each theory we focus on the environment or the context in which learning takes place, and the constraints and facilities provided through that context. When this context is changed by pedagogical intervention, technological affordances, social expectations, or a host of other variables, one can expect change in learning effectiveness or efficiency. Social learning—especially in its cyber-enhanced forms—has evolved in a context of rapid change, and many of its proponents are champions of this. However, the formal institutional structures where most of these changes take place are noted more for their resistance to change and defense of tradition, than for the capacity for rapid or emergent adaptation (Bates, 2005; Winner, 1997). Thus online learning has long been engulfed in controversy, and there has been considerable jockeying among those with a vested interest in either change or the status quo. While this tension will and probably *should* never be fully resolved, we believe that dedicated educators often share underlying assumptions about teaching and learning. This section is designed to explicate the rationale for social learning and expose both its promises and shortcomings.

Social Learning

The defining component of social learning is the presence and participation of other learners and, at least in formal education, a teacher. In this section we will outline the theoretical and empirical evidence indicating how and why the presence of others makes a difference to both teaching and learning.

ce of others makes a difference to both teaching and learning. Until recently, most literature on social learning assumed that the interaction between participants takes place face-to-face, and often in a classroom, laboratory, or other structured context. However, recent pedagogical literature, especially from distance education and e-learning perspectives often assumes an electronically mediated context for teaching and learning. It is natural to wish to compare the online and face-to-face alternatives. When considered overall, studies reveal no significant difference in learning outcomes between activities and courses that are taken at a distance and those in the classroom (Russell, 2010). This is not too surprising because it is possible to use any learning technology well or badly, regardless of the type. It makes no more sense to ask whether people learn better at a distance or face-to-face than to ask whether pictures drawn in pencil are better than ones painted with oils. They are different technologies that can produce both excellent and atrocious results. That aside, the reliability of most studies that show the benefits of technology to learning are dubious, conflating many different factors (Oblinger & Hawkins, 2006; Russell, 2010). However, it is likely that the constraints and affordances of communication and information technologies, especially factors related to the limits of the media, scale, distance, and time, do effect how we learn from and with each other.

Different constraints and affordances will lead to different ways of doing things. Some methods will be difficult or impossible using certain media, but this is true in any setting. Just as it would not be wise to teach appreciation of music at a construction site or without the means to make music, it would not be sensible to teach programming without a computer. But the devil is, as always, in the details. Measuring the effects of teaching interventions and factoring in other contextual variables such as the nature and effectiveness of the technology, the users' experience and efficacy, their motivation and the nature of the subject is difficult when they combine to create very complex and multifaceted learning environments.

Generations of Distance Learning

There have been many attempts to examine the history of distance learning in terms of dominant technologies (e.g., Bates, 2005; Gunawardena & McIsaac, 2004). We have taken a slightly different tack, looking instead at the evolution of pedagogies in distance learning (T. Anderson & Dron, 2011). These perspectives are not totally at odds because there is a strong case to be made for treating pedagogies themselves as technologies that only bring about improvements in learning when used in combination with other technologies (Dron, 2012).

At the very least, pedagogies and technologies are intertwined in a dance, where the moves of one determine the moves of the other (T. Anderson, 2009). In our three-generation model, we have divided the generations of developments in distance learning into three distinct pedagogical eras; at the time of writing, the third generation is still emerging. We consider each generation to be partly determined by the communication and processing tools available, and partly by the popular pedagogies of the period, noting

that changes in each one alters the adjacent possibilities and thus both the affordances and uses of the other. This codependency between tools and pedagogies is inevitable: until there are the means for cheap, rapid forms of many-to-many dialogue, for example, it is very hard to design distance learning experiences that require peer debate. Distance education was not a viable option at all until the advent of reliable and affordable technologies of production like the printing press, and communication systems such as a postal service.

Although we describe each generation as an historical sequence, this does not mean that previous generations have faded away or vanished. As Kelly (2010) has observed, technologies seldom, if ever, die. As new pedagogical models emerge, they do not replace what came before, though they may become more dominant than those they supersede. Not only is it possible to find large numbers of fairly pure examples of older approaches being used today, the newer generations incorporate the older ones in their assemblies so previous generations of pedagogy have become, if anything, more popular than they were when first adopted.

These are the three generations that we have identified as emerging so far:

1. Behaviorist/cognitivist: pedagogies of instruction
2. Social constructivist: pedagogies of construction
3. Connectivist: pedagogies of connection We treat each of these in turn in the following sections.

The Instructivist-Era: Cognitivist/ Behaviorist Approaches

Until fairly recently, there were very few alternatives to broadcast or distribute fixed media for distance learning. Mail, print, radio, TV, video or audio recordings made up the vast majority of media available to distance educators and students. Telephone, the postal service and, in some cases, two-way radio were about as good as it got if two-way communication was needed, which meant that communication was nearly always one-to-many or one-to-one. Before the advent of the postal service, distance education as we know it today was virtually impossible, so it is no coincidence that the first examples of the form date from the late eighteenth century when such systems became ubiquitous and reliable (Gunawardena & McIsaac, 2004).

It is almost inevitable, without much capacity to communicate, that an instructivist approach will become the dominant form of teaching. The notion that there is a body of knowledge that can be represented in written, spoken, or enacted form and communicated from the learned to the unlearned is a powerful one at the best of times, but when it is combined with a communication channel that limits dialogue in both quantity and pace, an instructivist approach is overwhelmingly likely to occur. There are exceptions: Piaget's constructivist pedagogies (1970), for example, focus on the construction of knowledge by an individual rather than simple conveyance of knowledge.

Instructivist teaching has, however, not historically been the dominant form of pedagogy, at least in Western culture. The Socratic form of pedagogic dialogue, for example, is inherently social. Apprenticeship models, while explicitly acknowledging that there are masters from whom to learn, are essentially conversational. Learning outside schoolrooms has almost always been a two-way flow of information. The "teacher" (whether a parent, peer, or formal pedagogue) imparts knowledge through telling and showing, but equally must pay attention to how and whether a learner is learning. With this in mind, and given that the focus of this book is on social learning, we briefly overview some of the main features of the cognitivist/behaviorist model of learning.

Cognitivist/ Behaviorist Pedagogies

Cognitivist/behaviorist pedagogies center on the individual as an autonomous entity to which certain stimuli can be applied in order to achieve a certain measurable output. Behaviorist pedagogies deliberately go no further than these observable inputs and outputs (Skinner, 1974), whereas cognitivist approaches take into account the mental models and internal processes, building on a richer psychological understanding of learning and how it occurs (e.g., Bruner, 1966; Gagne, 1985; Gardner, 1993). In each case, however, the viewpoint is that of an individual, and the individual processes that are involved in learning. The cognitivist/behaviourist tradition is also predominantly instructivist, inasmuch as it is assumed there is a body of material or specified measurable skill to be learned that may be transmitted to the learner. This mold begins to be broken in the Piagetian branch of cognitivism: constructivism (Piaget, 1970).

For Piaget and his followers, knowledge occurs as a result of connecting and constructing ideas, feelings, and structures. In cognitivist-constructivist approaches, learning is seen as a process of construction, building models, and connecting old knowledge with new. Every individual constructs a view of the world for him- or herself. This epistemologically different understanding of learning leads naturally to pedagogies such as problem-based, enquiry-based, and constructionist (learning by creating) methods of learning, which assume that, though there may be measurable outcomes reached by all, every individual constructs knowledge differently: starting somewhere different, learning differently, with different meanings attached to what they learn.

However, though epistemologically more advanced, the emphasis of such approaches is very much on the learner as an autonomous agent, learning alone. Although the learner may learn from others, learning itself is seen as something internal to the individual. This perspective is important: it is vital to understanding how individuals learn as much as how they learn with others. Much modern research in the area draws on our increasing knowledge of the brain and how we process and store information, leading to a field of study under the name of "brainbased learning" (Jensen, 2008; Weiss, 2000). Cognitive behavioral pedagogical models dominate training programs and much computer-based training, and have shown consistently improving results when teaching individuals to accomplish pre-determined behavioral objectives (see, for example, Fletcher, 2009).

Learning an an Inherently Social Process

Processes of meaning-making, integrating new information, and creating knowledge are not only enhanced and stimulated through reaction, discussion, and argument with others but also much knowledge confirmation, interpretation, contextualization, and validation happens only through interaction with others.

In an interesting study, Okita, Bailenson, and Schwartz (2007) tested learning and the degree of arousal (associated with engagement) for learners who believed they were interacting with an avatar controlled by a human being, versus those who believed they were interacting with an animated but machine-controlled agent. They found that the belief that one was interacting with a human resulted in both better learning outcomes and more engagement with the learning task.

Further confirmation that we think and behave differently when we believe we are interacting with humans comes from a fascinating study by Krach et al., (2009), in which all subjects engaged in the same task (interacting with a computer to play the Prisoner's Dilemma), but showed significant differences in functional MRI scans depending on whether they believed they were interacting with a machine or a human. This does not mean that learning cannot or does not happen when an individual is studying on his or her own or interacting with simulations, tutorial systems, or other learning modalities, but it does highlight the increased attention of learners when they are, or believe they are, interacting with real human beings.

Humans have evolved for millions of years in contexts where shared support and cooperative activity has increased survival probabilities (E. O. Wilson, 2012). Thus we have evolutionary propensities for positively opening our social and learning selves to others who serve as models and sources of information, and who provide direct assistance in solving many types of problems. In our primordial past, and perhaps to a greater degree in our networked future, human beings will continue to exploit and benefit from the support and assistance of others. In the past these potential assistants shared common time and space—now they are available anytime and anyplace.

Social Learning Theories

The poet John Donne's proclamation that no man is an island suggests our deep interdependence with others. It is an interesting but perhaps irresolvable debate as to which came first—whether it was the emergence of self from the family or tribal origins, or whether society emerged from the aggregation of many selves. Even when we are working alone, our language, metaphors, thoughts, and feelings are guided and created through the use of signs, symbols, and expressions that we have acquired from others. John Dewey's colleague and fellow pragmatist George Herbert Mead is most remembered for his notions of how a sense of self can only arise through discourse with others. He notes how "we are in possession of selves just in so far as we can and do take the attitude of others towards ourselves and respond to those attitudes" (qtd. in Pfuetze, 1954, p.78). But Mead goes even further, arguing that in interaction and cooperative work with others, the giving and taking of directions and advice allows us to develop critical forms of empathy to create appropriate and viable images of ourselves. He argues that "in giving directions to others, he gives them to himself, and thus arouses a similar response in himself which is understood by himself" (Pfuetze, 1954, p.79). This lays the groundwork for responsibility and self-control.

Lave and Wenger argue, "activities, tasks, functions, and understandings do not exist in isolation; they are part of broader systems of relations in which they have meaning. These systems of relations arise out of and are reproduced and developed within social communities, which are in part systems of relations among persons" (1991, p. 53). For most early psychologists, this social development and growth of the self took place in wide varieties of face-to-face interaction and dialogue that has characterized human evolution from the earliest times. Now, however, face-to-face interaction is but one of many modes through which we see ourselves reflected in the response of others. Whether mediated interaction inevitably suffers due to social cues being filtered out or the media allows forms of hyper mediation (Walther, 1996) that affords more effective means of social interaction, is at present an unresolved issue. However, there can be no doubt that mediated interaction has come to form a major role in supporting cooperative work, collaborative understanding, discourse, and individual growth, as media use consumes an ever-greater proportion of our daily lives.

Much social learning theory developed in reaction to the behaviorist notions that learning resulted only from direct exposure to reinforcements and punishments, and further from cognitive notions of individual knowledge acquisition. Albert Bandura and others argued that people learn a great deal without experiencing rewards or punishments directly but through vicariously observing the effect of these on others. Bandura (1977) wrote, “learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behavior is learned observationally through modeling: from observing others one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action” (p. 27). Bandura further noted the necessity of opportunities for practice. This practice is best done in social contexts so that it can be refined through reaction and feedback from others.

Humans learn socially in many ways, and one of the oldest of these is imitation (Warnick, 2008). Aristotle argued, “To imitate is, even from childhood, part of man's nature (and man is different from the other animals in that he is extremely imitative and makes his first steps in learning through imitation)” (1997, p. 57). Imitative learning has most often been studied among infants, but models of technical and cognitive apprenticeship also celebrate the effectiveness and efficiency of learning by imitation. However, learning by imitation has historically been limited by both time and space. Geographic separation can be overcome to a limited degree by video and immersion, but time restrictions also occur in place-bound and traditional forms of imitation. Asynchronous imitation occurs when one models the behavior, consciously or unconsciously assesses the means of expression, the rationale, or the arguments of others as displayed in their asynchronous uttering. This modeling often occurs when responding to discussion or problem sets, to which the answers of others already serve as visible models.

Social learning looks to the authentic clues that arise from interaction with others in a specific context. In the everyday interactions of individuals, problems arise and through negotiation, acquisition of information, and reflection, these problems are resolved (Dewey, 1916). Learning is not only the accumulation of facts and the understanding of concepts but also is both induced and confirmed through interaction and discussion with others. Even when one is alone, the shared use of language, cultural concepts, signs, and symbols both afford and constrain our understandings and creation of knowledge (Brown, Collins, & Duguid, 1989).

Social scientists have long struggled to match the predictability of their laws of human behavior with those developed in the natural sciences. Cognitive and behavioral learning models have strong roots in empirical science, in which the discovery of generalized laws of learning that can be applied across contexts is a major goal. One of the popular attempts used in economics and game theory is to develop models where rational decision-making on the part of the individual is assumed. However, Buchanan (1985) notes that rational theories break down because people talk to one another, change their minds, and utilize both overt and covert efforts to change others. Thus the capacity to communicate with one another is an essential skill and, as we have discussed, has long been an important tool for learning. However, communication and learning (whether face-to-face or at a distance) are very complicated—influenced by a host of variables including context, skill, attitudes, and the form of mediation used to convey that communication. In later chapters we focus on ways that our conceptual model of social organization may reduce this confusion. We next turn to pedagogies that were specifically developed to benefit from our propensity and capacity to learn socially.

Social Constructivism

Constructivism of the non-social variety has deep philosophical and pedagogical roots, and has been associated in a learning context with the works of John Dewey, George Herbert Mead, and Jean Piaget. Like many popular theories, it has been defined and characterized by many, often with little consistency among authors. However, all forms of constructivism share a belief that individuals construct knowledge dependent upon their individual and collective understandings, backgrounds, and proclivities. Debate arises, however, over the degree to which individuals hold common understandings, and whether these are rooted in any single form of externally defined and objective reality (Kanuka & Anderson, 1999). Since much of constructivism is touted as driving the current educational discussion, it should be noted that it is a philosophy of learning and not one of teaching. Despite this incongruence, many authors have extracted tenets of constructivist learning, and from them developed principles or guidelines for the design of learning contexts and activities.

Drawing mainly from the work of Vygotsky and Dewey, social constructivist models of learning emerged in the early part of the twentieth century, though they were only adopted on a widespread basis by the academic community from the 1970s onward, after Vygotsky’s work was discovered in the West, and Dewey’s half-forgotten writings began to be reinterpreted in the light of a Vygotskian understanding (e.g. Popkewitz, 1998). From a social-constructivist perspective, knowledge and knowledge creation is a fundamentally social phenomenon. Not only are meanings negotiated and formed in a social context, the process of education is one where learners move from one zone of proximal development to the next, mediated by others who have already reached beyond where the learner wishes to go. In distance learning, social constructivist approaches were prohibitively expensive until the

advent of affordable communications technologies. While there are many variants on the theme, social constructivist models share a number of common features that we outline in the following subsections.

Multiple Perspectives and Engagement that Includes Dialogue

Since knowledge is both individually and socially constructed, it follows that there must be opportunity, reason, and capacity for individuals to share, debate, and discuss their understandings. Individually, discussion is used to validate knowledge construction and to test its veracity against the understandings of others. Socially, groups of learners use one another to both amplify and dampen their understandings so as to construct understandings that are congruent—at least to the extent where cooperative action can be undertaken.

Learning in Authentic Contexts

If learning is to be meaningfully constructed, it must have worth for the individual learner. This value arises most easily if learning takes place in authentic contexts with genuine personal value that is perceived by the learner as both interesting and useful. Unfortunately, there are domains of knowledge that, in themselves, have little intrinsic meaning (at least for the majority of learners), but they are considered prerequisites for acquisition of more relevant knowledge to be studied at a later time. This focus on the prerequisite, regardless of its own authenticity or relevance, is typically over-valued by discipline-centered teachers, resulting in learners often being forced to ingest large quantities of information with little apparent value. Constructivist practitioners of authentic learning design activities that are wide-ranging enough so that their connection to the relevant "big picture" is apparent even at early stages of inquiry.

Inquiry and Problem-Solving

The inquiry and problem-solving features of constructivist learning emerge from the need for authentic contexts. Problems not only situate the learning in an authentic task-driven challenge but also provide motivation and focus to the learning process (Jonassen, 2002). This is especially important in collaborative learning where the diversity of interests, expertise, and aptitude may cause groups to move away from constructive problem-solving toward following the interests of dominating or particularly interesting diversions.

Learning is Open Ended and Ill-Structured

Most learning does not take place in classrooms, but in the real-life context of authentic problems situated in ill-structured environments (Spiro, Coulson, Feltovich, & Anderson, 1988). Thus constructivists prefer to situate learning problems in messier domains where there is no single comprehensive and correct answer. The ill-structured domain of the problem also stimulates discussion among learners as they attempt to construct a useful understanding of the domain and develop solutions to problems.

Cooperative and Collaborative Learning

Despite that fact most formal education takes place in group settings, very little of what goes on in traditional classrooms or online can be described as cooperative or collaborative. Rather, both teachers and learners usually conceive of learning as an internal cognitive process. Indeed, in many learning designs, students are set as competitors against one another, each striving for a limited number of high grades that will be allocated by the teacher.

Despite this individualistic orientation in current practice, there is a growing body of research demonstrating that cooperative and collaborative education not only results in greater learning but also is perceived by students as generally being more satisfying, and is associated with lower dropout rates. In a large meta-analysis of studies that included over 4,000 students comparing cooperative and collaborative learning to traditional individualized study, Springer, Stanne, and Donovan (1999) concluded that "students who learn in small groups generally demonstrate greater academic achievement, express more favorable attitudes toward learning and persist through science, mathematics, engineering and technology courses to a greater extent than their more traditionally taught counterparts" (p. 22).

There is an ongoing and generally inconclusive debate in the literature differentiating collaborative from cooperative learning. Generally, collaborative learning is considered to be less teacher-driven and more ill-defined than cooperative learning. Learners working collaboratively deliberately support one another's learning, negotiate the division of tasks, and help one another to learn by using and/ or developing group processes in more or less formal ways to produce some common or individual outputs. Cooperative learning tends to be based on more structural sharing. For example, students may research topics independently, or focus on parts of a broad topic and share them with others in the class. Although many writers and teachers use the terms interchangeably, we will be fairly specific in defining collaborative learning as a process where learners deliberately work together to achieve outcomes of mutual benefit, and cooperative learning as a process where independent learners do work that benefits themselves and other

students. Despite sometimes contested differences, there is a great deal of common theory and practice in both collaborative and cooperative learning. These similarities include:

- A teacher who is usually more a facilitator or guide than a "sage on the stage"
- Teaching and learning as shared experiences
- Students participating in small group activities
- Students taking responsibility for their own learning and that of their group
- Students stimulated to reflect on their own assumptions and though processes; and
- Social and team skills developed through the give-and-take of consensus-building (adapted from Kreijns, Kirschner, & Jochems, 2003, p. 337).

In Springer et al.'s meta-analysis (1999), attempts to describe learning designs they investigated as either cooperative or collaborative and then comparing results revealed no significant differences in outcomes. However, the collaboration or cooperation reviewed in these studies took place in face-to-face interactions. In a smaller study comparing the two in online interactions, Rose (2004) found that groups characterized as cooperative achieved higher degrees of in-depth processing in a shorter period of time than those working collaboratively. This finding is consistent with our own experiences of online learning in which coordination, task clarification, assignment, and negotiation seems to take longer in online and especially asynchronous online contexts. Of course, such skills are themselves valuable, need to be learned, and may contribute to outcomes that are not intentionally measured.

Given the theoretical and empirical evidence supporting the use of collaborative and cooperative learning designs, one might reasonably ask why this model is not employed more often in formal education. The answers may lie in the social norms that privilege independence and individualism in many Western countries. However, there are also pedagogical, organizational, and technical problems that challenge collaborative design implementations. From a pedagogical perspective, many educators conceive of learning as an individual process, and assess it as such accordingly. The central role of assessment in institutional learning thus drives it toward patterns that emphasize the individual at the expense of the group.

Communities of Inquiry

Our final model of conventional social learning, Communities of Inquiry, is partly a systems theory and partly a model for analyzing learning transactions that both predicts and describes behaviors. It concerns the elements that are essential to the social educational experience. Explicitly concerned with group learning (see figure 2.1), it identifies three kinds of presence within a social learning transaction:

- *Cognitive presence*. The extent to which participants can construct meaning through reflection and discourse,
- *Social presence*. The extent of identification with a community and trusting inter-personal engagement, and
- *Teaching presence*. The design, facilitation, and direction of social and cognitive processes (Garrison, Anderson, & Archer, 2000, 2001).

We will return to the community of inquiry model in some detail later but, for now, note that it provides a way of understanding how learning occurs within a group setting, where a group of intentional learners and one or more teachers build knowledge together.

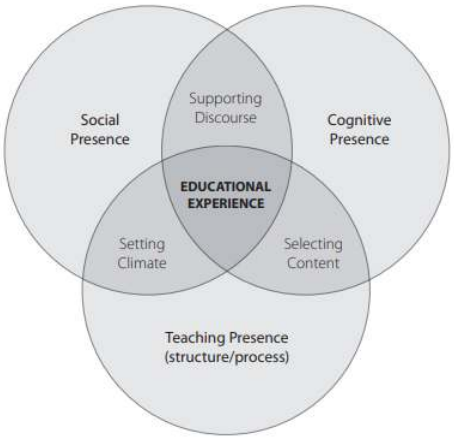


Figure 2.1 Community of Inquiry model (Garrison & Anderson 2003, p. 88).

The Connectivist Era

We argue throughout this book that the affordances of cyberspace offer new ways to approach all forms of human interaction and communication, including education. It is thus not surprising that new pedagogies and theories of learning have arisen that attempt to both explain and provide guidance to educators when teaching in net-infused contexts. There are many related theories that help to explain and recommend approaches to learning in networked contexts, outside the classroom. Each addresses a set of related concepts:

- learning is and should be unfettered by formal boundaries and delimited groups;
- learning is not just a feature of individuals, but of communities;
- learning is distributed not just in the heads of humans but in the tools, conceptual and physical, that they use, the artifacts they create, and the environments they build and inhabit;
- knowledge exists in a social and physical context as well as a personal one;
- structure and meaning can be an emergent feature of the dynamic learning system in which many individuals, loosely joined, can play a role in creating;
- diversity has value to the whole learning community, and individual differences should be valorized.

Since the late twentieth century, these themes have emerged from multiple disciplinary areas and, in sum, add up to a new and different way of thinking about learning. In making this assertion, we distinguish Connectivism (a theory created by George Siemens (2005)) from connectivism with a small "c," which we use as a generic term for a family of network learning theories. Just as there are many different variations on social constructivism that share the unifying characteristics, so there are variations of connectivism that share the common properties of knowledge emerging from and within a network.

Foundational Theories For Connectivist-Era Models

In the following subsections we explore some of the theories and models that have informed the connectivist era. While incomplete as theories of learning or teaching in themselves, they are woven into a fabric of ideas that informs the two most distinctive connectivist learning theories, communities of practice and Connectivism itself.

Heutagogy

The principles (and naming) of heutagogy were first articulated by Australian educators Stewart Hase and Chris Kenyon (2000). Heutagogy (derived from the Greek word for "self") is a direct result of self-determined learning theories and practice. Heutagogy brings these theories into a networked context by noting the ways in which the tools and resources for effective self-determined learning have been expanded exponentially through cyberspace. However, access to tools does not ensure that learners are capable of using them effectively. Thus, Hase and Kenyon also note the importance of *capability* in heutagogically based education. They write, "capability is a holistic attribute and concerns the capacity to use one's competence in novel situations rather than just the familiar, a justified level of self-efficacy for dealing with novel problems, having appropriate values, being able to work in teams, and knowing how to learn" (Hase & Kenyon, 2007, p. 113).

Heutagogy also stresses the need for learners to understand their own learning processes. This reflective capacity allows learners to direct their own learning when needed—even in the absence of a formal education structure. Interesting as well is Hase and Kenyon's (2007) distinction between *competencies* (the darling of many, especially vocational educators) and *capability*. Competencies are tested in known contexts and usually are focused backward on instruction already provided. Capability, however, looks to the future and celebrates the capacity to learn as contextually demanded. Increasingly, both workplaces and schools are changing rapidly, and thus the competencies acquired last year or last month may not provide the capacity to learn and apply that knowledge going forward in those environments.

Hase and Kenyon end their 2007 paper with a list of ways in which Heutagogical pedagogies are used to design learning processes applicable inside or outside of formal education. These capacities are magnified by the net-infused context in which collaboration, student input into content selection from vast open educational resources, self-reflection through tools like blogs, and greatly enhanced flexibility in where and when to learn are all afforded.

Distributed Cognition

The field of distributed cognition, originally developed by Edwin Hutchins (1995), is concerned with ways that the tools, methods, and objects we interact with may be seen as part of our thinking processes and extensions of our minds into the world. Rather than thinking of cognition as an internal process of thought, proponents of this perspective observe that memories, facts, and knowledge

may be reified and embodied in objects and other people we interact with. In many cases, the environment places constraints on our thinking and behaviour, or influences us to think and behave in certain ways and, in many cases, is an integral part of thinking. Objects and spaces are participants in the cognitive process, not simply neutral things that we use, but an inextricable part of how we think and learn, both as individuals and as connected groups (Salmon & Perkins, 1998). S. Johnson provides a nice illustration of this: he talks of the successful landing of a plane damaged by geese as "a kind of duet between a single human being at the helm of the aircraft and the embedded knowledge of the thousands of human beings that had collaborated over the years to build the Airbus A320's fly-by-wire technology" (2012, Introduction, Section 2, para. 10). Knowledge is not just held within the artificial intelligence that guides the aircraft—although the subtle interactions with the autopilot do play a role—but in the design of controls, seats, and other artifacts through which pilots, co-pilots, and others interact with one another and the vehicle (Hutchins & Lintern, 1995; Norman, 1993). Similarly, we as individuals offload some of our cognition onto the objects around us—the organization of books on a bookshelf, the things we lay out on our desks, the pictures on our walls, and the cutlery in our kitchen drawers, all act as extensions of our minds that both reflect thinking and engender it. As Churchill (1943) said, "We shape our buildings and afterwards our buildings shape us."

Distribution not only applies to unthinking objects but also to us and the people around us: cognition is a social process where different people play different roles, leading to the distribution of knowledge within a group or network of people (Salmon & Perkins, 1998). A simple demonstration of this is the loss of cognitive capacity that occurs when couples split up or one partner dies. The remaining individual will have come to rely on their partner to remember things, perform activities from washing dishes to doing accounts, and vice versa, a process sometimes described as "socially distributed remembering" (Sutton, Harris, Keil, & Barnier, 2010). Whether in intentional organizations or looser networks, this socially distributed remembering allows us to do more and think further (S. E. Page, 2011).

Activity Theory

Most commonly associated with social constructivism but equally central to understanding connectivist models, activity theory emerged from the work of Soviet psychologists in the early-to-mid twentieth century such as Leontev and Vygotsky, who were attempting to find ways to explain how individuals and objects worked together as dynamic systems. The binding concept of an activity from which the name is derived is concerned with subjects doing things, typically together, engaging in activities through mediating objects or tools—be they physical or mental objects. It was elaborated on and brought to the West primarily by Engeström (1987) who added "community" to Leontev's individual and object as a fundamental unit of interaction.

One of Activity Theory's most distinctive features is its insistence that, in understanding the mental capabilities and learning of an individual, it makes no sense to treat an isolated person as a unit of analysis: the physical, cultural, and technical world that he or she inhabits is as much a player in any activity as the mental processes of the individual who engages in it. Activity Theory describes actions in a socio-technical system by considering six interdependent and related dimensions:

The object—the purpose of the activity

The subject—the individual actor

The community—the combination of all actors in the system

The tools—the artifacts used by actors

The division of labour—how work is divided and tools mediate the activity

The rules—things that regulate and guide the system

These interdependent parts are usually represented as a pyramid that illustrates their interactions (see figure 2.2).

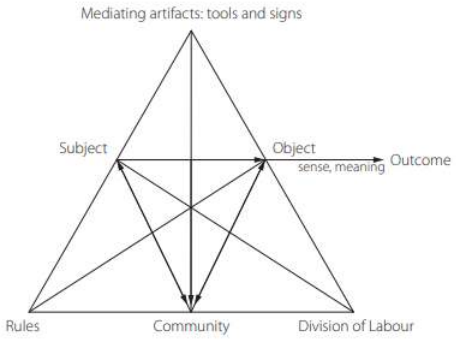


Figure 2.2 Activity theory view of a human activity system (Engeström, 1987, p. 78).

Activity Theory is not predictive, but provides a framework for understanding the complex ways that humans interact with the world and one another through mediating artifacts. The main lesson to take from its sometimes arcane perspective on the world is that, if we are to understand the ways individuals behave in a social context, it is important to consider not just their mental processes, but their interactions with the entire activity system including, importantly, the physical and mental tools and processes that they use. Combined, they provide a way of understanding consciousness as a social phenomenon that extends into and is inextricable from the world, the tools, and the signs (notably language) that people employ. In a very real sense, tools mediate between people and the world, not as simple channels, nor as a means of achieving ends, but actively affecting how the world is experienced and perceived. This makes it highly relevant to the context of networked learning, in which interactions are mediated and objects play not just a supportive role, but an architectural one in learning.

Actor Network Theory

Like Activity Theory, Actor Network Theory (ANT) is concerned with systemic interactions of people and the objects that they use in their interactions. While sharing some of the terminology and related conceptual models of activity theory, Actor Network Theory emerged from a very different tradition and has a complementary agenda. Conceived by Latour (1987, 2005) and elaborated by Law (1992), it was created in the context of social practices in science and technology, mainly in reaction to sociological and technologically determinist views of the role of technology in society. Latour, in particular, sought a "scientific" way of describing the behaviors of people that avoided self-referential explanations of the "social," therefore avoiding latent assumptions. His objective was to rebuild sociology from the bottom up without reference to what he saw as fuzzy or ill-defined terms that had bogged down the discipline, most notably eschewing use of the term "society" itself as a simple given.

Actors in an actor network may be human or non-human, with no special priority given to either. Instead, actors are constituted in heterogeneous relationships with one another: they form networks of related pieces that have no distinct edges. Given that such networks are continuous and unbounded, ANT helps educators to understand how some collections of actors may be thought of and considered as individual actors in their own right—for example, we can say things like "Athabasca University tops the league table of open universities," or "the US invaded Afghanistan." In the language of ANT, some networks may be black-boxed. In other words, we may choose to treat a complex network as a single entity, and to consider it in its relationships with others as a single actor.

Complexity Theory and Complex Adaptive Systems

Another notable feature of theories from the connectivist era is that they describe emergence and draw on the dynamics of complex systems. Complex systems are those where new and often unpredictable behavior emerges out of multiple interactions of entities, where the interactions are known and follow fixed rules: the weather, for instance, is a good example of this, as are rainforests and eddies in flowing water. Complex *adaptive* systems (CASs) consist of interacting entities that adapt in response to changes often brought about by other entities: evolution, ecosystems, cities, economies, stock markets, and termite mounds are good examples of these (Kauffman, 1995).

Educational systems may be thought of as CASs: while they are typically constrained by top-down governance and rules that determine the range of behaviors that can occur, there are many parts which are complex and adaptive, including learning itself, where patterns and behaviors emerge as a consequence of individual actors and their interactions. Once we enter the world of informal learning, especially in the context of networks and sets, patterns that emerge are almost always complex and adaptive but, even in the most controlled institutional learning contexts, educational systems are open, unbounded, and connected to human and

natural systems. This is the problem that confronts any educational researcher who attempts to analyze the effectiveness of a given intervention: it is never, in principle, possible to control all the variables that may affect any learning transaction.

Emergent behaviors arise when autonomous yet interdependent agents interact with one another within a context that partly determines the possibilities of interaction, and that is itself warped by the interactions of agents within it. This means that one of the most important defining characteristics of all complex systems is that they are, at least at some scales, unpredictable. While we can recognize patterns and broad tendencies, it is theoretically impossible to predict any particular event. The famous "butterfly effect," whereby the flap of a butterfly's wing in one part of the world might cause a storm in another, was a term originally coined by Edward Lorenz to describe his work (Lorenz, 1963) on what would later come to be known as chaotic systems. Lorenz (1963) showed conclusively that, though an entirely deterministic system, the weather at any given time is impossible to reliably and accurately predict from a previous known state. That a butterfly's or (in its original formulation) a seagull's wing flap can affect weather systems on the other side of the planet is a captivating, mathematically provable if empirically untestable image. Such sensitivity to initial conditions is observable in far more mundane and commonplace events that we can more easily observe, such as the movement of individuals in a crowd, the patterns of drips from a tap or the cascades of sand on a dune. But hand in hand with unpredictability come large-scale emergent patterns, in which higher levels of order emerge from small-scale interactions, such as can be seen in everything from ripples on a pond to life itself (Kauffman, 1995). In an educational context, theorists look for and attempt to predict "transformations or phase transitions that provide the markers for growth, change, or learning" (Horn, 2008, p. 133).

If systems are complex and unpredictable, they are not easily explained by positivist researchers and educators who attempt to eliminate or control all the variables that affect a learning transaction. Rather, those with a perspective based on recognizing complexity seek social structures that allow effective behavior to emerge and evolve and ineffective ideas to be extinguished. Researchers in CASs seek to understand features of the environment, and especially social or structural norms or organizations that resist either overt or covert attempts at self organization. Such attempts to stifle emergence may be impossible and involve a large expenditure of effort. Horn argues that "the management of social organizations of all types has been maintained by control measures that work to block the capacity of systems to operate autonomously" (2008, p. 133). These blocking mechanisms were designed for educational systems so that learners can operate in close proximity with one another without becoming mutually destructive or descending to chaos. But these same control mechanisms can thwart the emergence of adaptive behaviors and phase shifts that provide potential for rapid and profound learning.

Implications of complexity theory for learning and education operate on at least two levels. At the level of the individual learner, complexity theory, like constructivist theory, supports learners' acquisition of skills and power such that they can articulate and achieve personal learning goals. By noting the presence of agents and structures that both support and impede emergence of effective adaptive behavior, individual learners are better able to influence and indeed survive in often threatening and always complex learning environments.

At the organization level of either formal or informal learning, complexity theory points to the social structures that we create to manage that learning. There is usually some level of self-organization going on in all complex systems, brought about by a combination of diverse learners with diverse backgrounds, needs, interests, and a wide range of ways to interact with one another, their surroundings, teachers, and learning resources. Any schoolteacher who has experienced a wasp or a thunderstorm in a classroom of children will be familiar with the way that small perturbations can have large effects on the learning behaviors and activities that are occurring, no matter how well planned they might have been in the first place. Even so, most of us can recall occasions when poor and stultifying approaches to teaching still resulted in good learning, often because of interactions with other learners or the chance discovery of interesting learning materials.

Good teachers adapt and change behaviors as the environment, context, and interactions between learners change. However, the self-organizing facets of a learning system can work against this, making it an uphill struggle. Complexity theorists (e.g., Kauffman, 1995, p. 233) talk of different levels of orderliness in self-organizing systems: the "Red Queen" and "Stalinist" regimes. When there is too much chaos and unpredictability, systems are always running to stay in the same place, like the Red Queen from *Alice Through the Looking Glass*. Conversely, if there is too little dynamism and change, then things settle down to a fixed and unchanging point or set of points—the Stalinist regime. Neither is helpful in learning. From the point at which these management functions begin to inhibit the emergence of positive adaptive behavior or facilitate and sustain behaviors that are not conducive to deep learning, we can expect negative results. The emergence of complex self-organized behavior occurs between the realms of chaos and order, for which Doyne Farmer coined the term "the edge of chaos" (Langton, 1990). Organizational structures should help us to surf the edge of chaos, not eliminate or constrain the creative potential of learners and teachers. Further, this

understanding can guide us to create and manage these complex environments, not with a goal of controlling or even completely understanding learning, but instead with a goal of creating systems in which learning emerges rapidly and profoundly.

Complexity theory also encourages us to think of learning contexts—classrooms, online learning cohorts, and so on—as entities in themselves. These entities can be healthy or sick; emerging, growing, or dying. By thinking at the systems level, reformers search for interventions that promote healthy adaptation and the emergence of cultures, tools, and languages that produce healthy human beings.

Learning designers following complexity models eschew the linear processes associated with much instructional design theory. Rather, they situate learning in contexts that are characterized by fluidity and turbulence, located near the edge of chaos, with rich possibilities for diverse actions and reactions, in complex contexts, and the presence of strange attractors, where order emerges from chaos. Most importantly for our study of networked learning, high-quality learning contexts are marked by "interconnectedness of and intercommunications among all parts of the system" (Laroche, Nicol, & Mayer-Smith, 2007, p.72). Thus, individual learning is enmeshed in the complex social experience and context of group, network, and collective social activity and culture.

Complexity theorists have drawn examples from many contexts to show the power and usefulness of emergent organizations and their capacity to thrive without total understanding, much less control, of the context in which they exist. Connectivist-era models of learning embrace this uncertainty and seek ways to utilize complexity without the potential drift to chaos that a lack of top-down organization might entail.

Connectivist Learning Theories

Two connectivist theories have emerged as central and archetypal. The first, with the longest history, is that of communities of practice and its successor, networks of practice. The second is Connectivism, as propounded by its creator Siemens, with contributions from his collaborator Stephen Downes.

Communities of Practice

The theory of communities of practice was established in the work of Lave and Wenger (1991) and fully expounded in Wenger's seminal book, *Communities of Practice* (1998). Lave and Wenger sought to explain and improve upon learning that occurs outside of formal group-based courses, typically in the workplace or among co-located learners in communities. The theory describes primarily informal processes of community formation and growth, though much of Wenger's more recent work has focused on approaches to deliberate fostering of such learning communities. The concept, drawn from anthropological studies, relates to how newcomers to a collection of people, such as a department in a firm, a university, or a group of charity workers, learn the group's practices and become participants in the community. At first, Lave and Wenger used an all-encompassing notion of "legitimate peripheral participation" to describe the process of becoming a full member of the learning community, but Wenger's later work unpacked this in terms of

- mutual engagement—the group-like formation of shared norms and methods of collaboration,
- joint enterprise—a shared set of goals and purposes, also known as the community's domain, and
- shared repertoire—a set of resources, both physical and conceptual, that the community shares (Wenger, 1998, p. 73).

The concept of shared repertoire, in particular, echoes the notion of distributed cognition and sharply distinguishes this as a networked learning theory, in which both human and non-human actors in a network are mutually constitutive and joined together. Part of the value of the concept of a community of practice is that it treats learning as dynamic and situated, and describes ways that tacit knowledge spreads through a network, as opposed to the more formal methods of deliberate learning that may convey explicit and implicit knowledge, but do not (and, according to Polanyi (1966) *cannot*) succumb to explanation and formalization.

A particularly powerful aspect of the theory is its description and explanation of boundaries. In a conventional intentionally formed group, boundaries are defined easily: one either is or is not a member of the group, and there is usually a process involved in joining or leaving it. In the fuzzier realm of communities of practice, boundaries are typically emergent phenomena that arise out of shared practice, a bottom-up process resulting from the joint enterprise that naturally channels the community and separates it from others. Central to this idea is the importance of those who exist at or near the boundaries, and who cross them between communities of practice. Boundaries are spaces where learning is particularly likely to happen, because that is where different conceptual models are likely to clash or merge, where "competence and experience tend to diverge: a boundary interaction is usually an experience of being exposed to a foreign competence" (Wenger 1998, p. 233).

The divergence can be both creatively inspirational and a cause of conflict. Wenger's boundary-crossers may be networked individuals who move beyond and between closed communities, cross-fertilizing each community with ideas and practices of others. There may be more or less concrete boundary objects, including symbols and metaphors that are technological connectors like social software platforms and the processes enabled through them, which act as a means to bridge different communities. Communities thus become networked by boundary-crossing in order to play the role of one another's teachers, spread knowledge within the community, and also engender changes in knowledge in other communities.

Models and interventions based on communities of practice have been widely adopted in many sectors. The concept is not, however, without its problems. First, the term carries multiple terminology and disciplinary understandings associated with the word "community." Second, different researchers often understand the degree of formality of the "practice" differently. The "community of practice" label has been applied to emergent, informal, and spontaneous organizations of face-to-face professionals, but it has also been used to describe managed professional development activities which almost preclude only voluntary participation. Schlager & Fusco (2004) use the term extensively to define, and Wenger's theory to describe, online educators' forums (such as TappedIn); yet after years of studying this rather large community of practice, "the question of whether the users of the TappedIn environment collectively constitute a community or practice remains unresolved" (Schlager & Fusco, 2004, p. 121). In many ways, the blurring of the term has led to it being hijacked by those who are more fixed in a social-constructivist model of the world, so although communities of practice are, in the way Wenger first described them, in the vanguard of the connectivist era of learning theories, they still have one foot firmly planted in older models of learning.

Networks of Practice

Perhaps because of the fuzzy borders between networked and grouped ways of thinking of communities of practice, Wenger, Trayner, and Laat (2011) have extended the notion of communities of practice for the networked age, taking advantage of more recent work that treats networks and groups as distinct and separable social forms (e.g., Downes, 2007; Rainie & Wellman, 2012; Siemens, 2005). Although Wenger's earlier work did describe ways that knowledge spreads through a network, he did not explicitly distinguish between intentional groups and the broader, looser spread of network connections. In this more recent work, Wenger et al. make the distinction between communities (what we call "groups") and networks. Because networks do not have a specific domain or shared enterprise, they differ from communities of practice in some important ways:

> The learning value of a network derives from access to a rich web of information sources offering multiple perspectives and dialogues, responses to queries, and help from others—whether this access is initiated by the learner or by others. On the one hand, because of personal connections, networking enables access to learning resources to be very targeted—whether one sends an email query to a friend or decides to follow someone's Twitter feed. On the other hand, because information flows can be picked up, interpreted, and propagated in unexpected ways, they traverse networks with a high level of spontaneity and unpredictability. This potential for spontaneous connections and serendipity—and the resulting potential for collective exploration without collective intention or design—is a key aspect of the value of networks for learning. (Wenger et al., 2011, p.12)

While communities/groups are concerned with building a shared identity and fostering trust and commitment, networks, if they can be said to be concerned with anything at all, are about fostering and optimizing connectivity. Because networks are emergent features of connections with others, this concept is far more blurred and hard to grasp than it is in the context of groups, especially as those who are part of a network may not even be able to see the network, let alone view or affect aspects of its structure. Nonetheless, Wenger et al. identify a wide range of indicators to identify value within networks and make tentative steps toward identifying how such value may be reified through structured storytelling. This approach carries with it an underlying assumption that the networked learner is concerned with meaning-making in a constantly shifting, dynamic context. It is a process in which the creation of value is linked to the creation of content; the process of navigating a network and interacting with others in it is a process of learning in and of itself.

Connectivism

George Siemens coined the term *Connectivism*. In his 2006 book, *Knowing Knowledge*, he described it as "the integration of principles explored by chaos, network, and complexity and self-organization theories" (Siemens, 2006, p.30) Like Heutagogy, and drawing on the conceptual underpinnings of distributed cognition, actor-network theory, and communities of practice, connectivism assumes a context connected through pervasive networks that link not only individuals but also machines and resources as well. Siemens (2005) articulated eight oft-quoted principles of connectivism:

- Learning and knowledge rests in a diversity of opinions.

- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in non-human appliances.
- Capacity to know more is more critical than what is currently known.
- Nurturing and maintaining connections is needed to facilitate continual learning.
- The ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
- Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality.

Connectivism shares many of the attributes of constructivism, notably in its valorization of diversity and a philosophical basis that knowledge is constructed in a social context. Like Heutagogy, Connectivism values capacity over what is currently known and proposes students learn how and what to learn and have input into this process.

Connectivism draws heavily from distributed cognition and actor-network theory in its view of learning in non-human appliances. This is about the traces that we leave in our networked lives, the artifacts through which we build and share knowledge and create new ideas, the tools and objects we offload cognitive functions to and think with. From the first time humans scrawled signs and images on cave walls or in the dirt, they were offloading part of their intellect into external space. Like those who rail against Wikipedianism and the Googlization of society today, Socrates saw this as problematic, as Plato relates in Phaedrus on the subject of the invention of writing:

> The specific which you have discovered is an aid not to memory, but to reminiscence, and you give your disciples not truth, but only the semblance of truth; they will be hearers of many things and will have learned nothing; they will appear to be omniscient and will generally know nothing; they will be tiresome company, having the show of wisdom without the reality. (Plato, trans. 1993, pp. 87-88)

Notwithstanding these dangers, this offloading enables us not only to stand more easily on the shoulders of giants but also on the shoulders of our peers, and to enable them to stand on ours.

Connectivism also acknowledges the speed with which knowledge expands and changes in net-infused societies. By being connected to both other humans and knowledge resources, we retain currency and benefit from the diversity of ideas and cultures that abound. Through our awareness and maintenance of these connections, we become able to create new connections, resolve problems for ourselves and others, and thus become truly networked lifelong learners.

There are some aspects of Connectivism—the theory itself, rather than the family of theories—that we remain unconvinced by. Siemens and particularly Downes have taken it to be a complete theory of learning, following from connectionist views of psychological reality, in which networks like the Internet and our social networks of knowledge are directly analogous to connections that we make in our brains and, ultimately, the synapses of which they are comprised (Downes, 2008a). While there are some strong topological similarities between these networks, there are also strong topological similarities between them and the patterns of flu virus epidemics and song charts (Watts, 2003), but this does not make them qualitatively similar. Connectivism presents one of the most compelling theories of the networked era of education, but it is, as its authors are happy to admit, a work in progress that provides a blueprint for others to follow, rather than a bible that must be adhered to in every respect.

The Holist Era?

No single generation of learning has ever superseded the last. Like all technologies, learning technologies evolve by assembly (Arthur, 2009) and incorporate and extend what came before. One does not need to look far to discover plentiful examples of each generation, often coexisting in the same course or set of learning transactions.

Connectivism as a theory in itself, as opposed to a collection of related theories, has been criticized on many fronts. Some suggest that it is not a theory at all (Ireland, 2007) but the more substantive critiques mostly relate to its notable inefficiencies (Kop, 2011; Kop & Hill, 2008; Mackness, Mak, & Wiliams, 2010). The vast majority of people who start out taking explicitly Connectivist courses, typically run as MOOCs, fail to finish them. However, the concept of “finishing” is itself not entirely relevant to connectivist learning. Its explicit emphasis on emergence rather than planned learning means that it is hard to measure whether targets have been reached at all, much less with efficacy, and perhaps more disconcertingly, it is far from clear whether the resulting learning might have been more effectively or efficiently achieved in some other way. In response to these and other criticisms as well as opportunities afforded by new technologies, there has been an evolution toward a more holistic model that incorporates all earlier models of learning, including connectivist models. We have christened this the ‘holistic generation,’ in recognition of the fact that it encompasses all earlier models.

Holistic approaches to learning are agnostic as to method. Drawing from connectivist and older models, they valorize diversity and the socially distributed cognition afforded by the read-write Web and other publishing models, accepting that every learning experience is unique, and every learner's needs are different. Connectivist approaches, for all their extensive reliance on networks of people engaging socially, are at heart focused on the individual—specifically, the individual's learning. Holistic models embrace the fact that it is sometimes more important that a group learns, rather than an individual, especially in collectivist cultures (Potgieter et al., 2006). Holistic models recognize that, sometimes, guidance is what is most needed, that people can learn without direct engagement with others and, even that transmittive instructionist models of teaching have a place.

The current generation of large-scale MOOCs provide a good example of this. Courses from the likes of Coursera and Udacity tend to follow a highly instructivist model but, because of their size, spawn networks and study groups of learners who meet face-to-face, and through various social media such as Facebook, to enhance and support one another using quite different and more connectivist approaches. To support diversity and maintain the right amount of coherence for any given learner, holistic approaches are, like connectivist methods, heavily reliant on technologies. In particular, they make use of tools that can aggregate the actions and behaviors of many people in order to help make sense of a topic for those that follow. Social and learning analytics, collaborative filters, recommender systems, reputation management tools, and social adaptation systems are used to counter the torrential flow of information and plethora of connections that characterize the connectivist process. We will discuss most of these in greater detail later in this book, but for now, note that one of the main features of such systems is that they use, directly or indirectly, the diverse knowledge and actions of a crowd.

Theory of Transactional Distance

Beyond broad families of learning theories, the theory of transactional distance has been highly influential in distance learning teaching and research. It is a theory of instruction rather than learning, and it was developed within the specific context of distance education programming. Like activity theory, ANT, and complexity theory, it is a systems theory that looks at the interactions of agents and the effects that those interactions have on the behavior of the system. As noted previously, social learning takes place in both formal and informal settings and in distance, classroom, and blended contexts. Nonetheless, it is perhaps most powerfully apparent when it operates beyond the limitations of time and space as a means of supporting distance education and distributed learning.

Moore (1993) attempted to develop a theoretical model that addresses both structured instructivist and dialogic social-constructivist models of distance education, and provides guidelines for creating mixtures of the two. Moore argues that the "distance" in "distance education" should be considered not in either geographic or temporal terms, but as a psychological and communications gulf between learner and teacher, measured on a continuum of structure and dialogue. The basic tenet of the theory is that a negative, "transactional distance" separates learners and instructors from one another and learners from the content they wish to master. This is not to suggest that high transactional distance necessarily leads to poor learning outcomes, but merely that there is greater transactional separation between learner and teacher.

Moore (1993) postulated that there are three dimensions of transactional distance—structure, dialogue, and autonomy. Structure refers to the degree of activity, learning outcome, media, and content selection that is prescribed by the instructor or delivery institution. Dialogue is the interaction between and among students and teachers, determined by factors such as the number of students in a given class, the degree of familiarity and cultural understanding among participants, the nature of learning activities engaged in, the immediacy of the technologies employed, and the sense of integration and identification with the educational institution, content, and other participants (Tinto, 1975). Autonomy is "the extent to which, in the teaching/learning relationship, it is the learner rather than the teacher who determines the goals, the learning experiences, and the evaluation decisions of the learning programme" (Moore, 1993, p. 28). Autonomy is dependent upon the self-discipline, existing knowledge, and self-motivation needed by learners to thrive in contexts that are not completely prescribed by external agents (teachers and rigid curriculum). As Candy (1991) observes, self-direction is a variable quantity that shifts in different contexts and is influenced heavily by external stimuli.

The educational designer has an opportunity to manipulate the structure and amount of dialogue in the learning sequence. High and low levels of each variable present educational opportunities in four quadrants, measured according to the degree of structure and dialogue found within them (Kawachi, 2009).

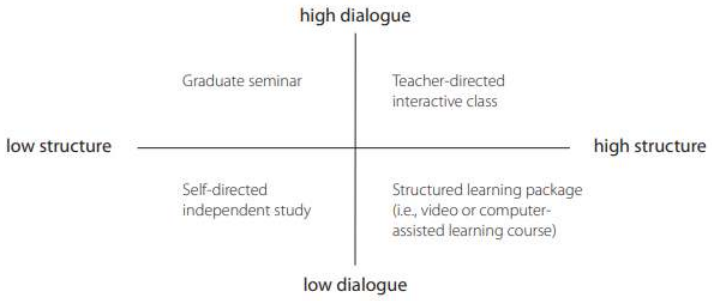


Figure 2.3 Transactional distance quadrants (adapted from Kawachi, 2009).

As illustrated in figure 2.3, there are many potential classic forms of formal and informal study that are associated with each of the quadrants. However, each learning context results in more or fewer restrictions on student freedoms, and each is associated with different degrees of scalability, speed of production, direct and indirect costs, and other variables. Rather than dispute the value of intense interaction as advocated by proponents of collaborative and cohort models of distance education (Garrison, 2000) or celebrating the autonomy offered by individual study (Holmberg, 1986), Moore's transactional distance theory (1993) helps us create models that trade off the advantages of both. Anderson has argued for an equivalency theory that postulates "deep and meaningful formal learning is supported as long as one of the three forms of interaction—student–teacher; student–student; student–content—is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience" (2003, p.4). Thus, tension exists between developing formal learning programs that decrease transactional distance by increasing interaction and decreasing prescriptive activity, and providing access to educational experience that is of both high quality and affordable cost.

This accords with Moore's own view (1993) that effective learning may occur whether transactional distance is high or low: structure or dialogue may be used effectively to improve learning. However, Saba and Shearer (1994) have demonstrated a system dependency that implies the more there is of one, the less there is of the other. As structure increases, it reduces the opportunities for dialogue, and as dialogue increases, it breaks up any intended structure. For example, a broadcast video lecture, one of the most highly structured forms of teaching, offers no opportunities at all for dialogue, at least while the lecture is playing. Conversely, a web meeting equivalent of the same lecture, if chat or audio are enabled for participants, allows participants to interrupt, ask questions, seek clarification, and change the pace or direction of the speaker. As a consequence, the event becomes less structured. At its most extreme, a dialogue between multiple participants may exhibit nothing but emergent structure.

Transactional Distance in Crowds

While Moore's theory (1993) applies well within a traditional formal distance learning setting and has been verified and applied many times (e.g., Chen & Willits, 1998; Lowe, 2000; Stein, Wanstreet, Calvin, Overtoom, & Wheaton, 2005; Zhang, 2003), its applicability outside this setting, especially when social forms beyond the traditional dyadic or group modes of engagement are in play, is less clear. Transactional distance in social spaces that are not tightly controlled by a teacher is a complex phenomenon, whereby the teaching role may be distributed, anonymous, or emergent as a consequence of behaviors in a crowd, where the learner may be a contributor and active shaper of activities and content. We will be arguing that the concept applies differently under such circumstances and that, though the dynamic between an individual learner and teacher strictly obeys the inverse relationship between structure and dialogue, there are ways to bypass the problem when the teaching role is embodied in a crowd.

Moore (1993) does not distinguish between the communications gulf and psychological distance in their roles as definers of transactional distance, but as we have explored the range of ways that transactional distance operates within our typology of social forms, we have come to realize that the two aspects, communication and psychological gulf, are entirely separable. In some forms and tools used within new social media, it is possible to be in close and constant two-way communication without significant psychological attachment, without closeness to another human being. Less commonly, there may be a sense of closeness without significant two-way communication. Both psychological connection and communication are important aspects of what creates distance. For minimal transactional distance, negotiable control, rich communication, and a feeling of closeness (in a psychological sense) are all important. Reducing any one of these increases transactional distance, and each variable is potentially independent of the others.

Transactional Control

Like author Anderson, author Dron (2007b) has also examined Moore's theory of transactional distance (1993) and found equivalencies: most notably, that the "distance" of which Moore speaks is actually composed of two distinct and largely independent variables. On the one hand, transactional distance is a mental phenomenon, a measure of the psychological and communications gulf between learner and teacher. On the other, it is a systems phenomenon that may be more precisely defined as an issue of control, which explains much of the negative correlation between dialogue and structure observed by Saba and Shearer. Both psychological/communication and control aspects are important, but they operate independently from each other.

From a systems perspective, when transactional distance is high, learner control over the learning transaction is lower and teacher control is higher, the teacher or teaching presence largely determining the learning trajectory. Through dialogue it is possible to negotiate control, and thus lower the transactional distance. The more dialogue there is, the more control is distributed among the participants. For example, learners can ask questions, seek clarification, express confusion, boredom, or interest, thus changing the path of the learning trajectory. The third dimension of Moore's model (1993), autonomy, equates to the learner having control over his or her learning trajectory, requiring neither structure nor dialogue. Dron's theory thus unifies the three variables identified by Moore in transactional distance theory by treating all as part of a continuum of control, from autonomous learner control through negotiated control via dialogue, to teacher control through structure (Figure 2.4).

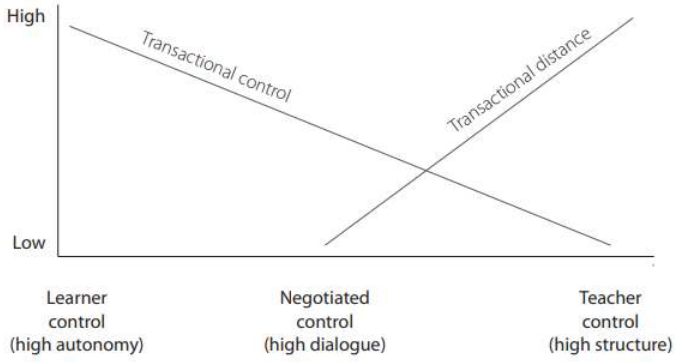


Figure 2.4 The relationship between transactional control and transactional distance (adapted from Dron, 2007, p.32).

Most real-life learning transactions occur at some point along the continuum of complete learner control through to complete teacher control, and they seldom if ever occur at the extremes. Even in the most regulated transactions learners may choose to tune out, switch off, and will always reinterpret or construct their own understandings; conversely, even the most autonomous of learners will usually allow some of their control to be taken away by narratives provided by the author of a book, director of a video, or creator of a website.

Cooperative Freedoms

It is valuable to unpack the notion of control a little further, as it is of some significance in all forms of learning, especially in a social context. Garrison and Baynton (1987) provide the important insight that control is not simply a question of choice. In order to make effective learning choices, the learner needs *independence*—which, as Candy (1991) shows, is a highly situated and context-sensitive variable—*power* (the capacity to exercise that independence), and *support* (the tools, people, and processes needed to implement that power). However, for the idea to have any meaning at all, it is necessary to know some of the constraints and factors over which learners may exercise control. If control is an important aspect of an educational transaction, we need to understand the nature of what can be controlled in a learning process. Morten Paulsen's theory of cooperative freedom (2003) describes a range of possible freedoms that might be available to a learner in a formal learning setting. His hexagon of cooperative freedoms (see figure 2.5) describes six dimensions:

- Place: freedom to choose where one learns
- Time: freedom to choose when one learns
- Pace: freedom to choose how fast or slow one learns
- Medium: freedom to choose the media used for learning
- Access: freedom to learn regardless of qualifications or extrinsic obstacles
- Content: freedom to choose what one learns

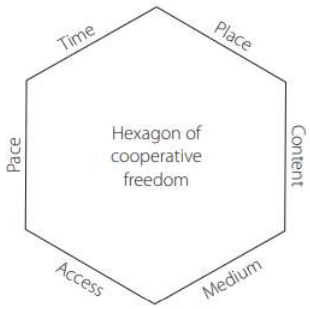


Figure 2.5 Paulsen's model of cooperative freedoms (adapted from Paulsen, 2003).

Paulsen's cooperative freedoms provide a fairly complete picture of freedoms in a formal, institutional learning context. However, there are gaps, and it does not describe well the different models of formal learning, such as those in connectivist transactions, or less formal learning environments. To Paulsen's list of six dimensions, T. Anderson (2005) added the freedom of *relationship*, that describes the ability to choose with whom and how one engages with others, an essential freedom if we are concerned with social learning. Related to freedom of relationship but distinct from it is the freedom of *disclosure*: deciding to whom one discloses one's communications. This is concerned with privacy and is of some significance to learners who may be fearful of displaying their ignorance. Disclosure is a more pronounced problem when entering the public realm rather than a closed group, although the commonplace requirement for students to engage with others in a group can also greatly limit this freedom.

In addition to these freedoms, Dron (2007a) has observed that there is also a meta-freedom to choosing whether or not and when to choose: the freedom of *delegation*. To be in control of one's learning, it is essential to be able to submit to the control of others when we do not ourselves have sufficient knowledge, experience, or time to decide what and how to learn next. Another freedom that is not quite addressed by Paulsen's "medium" is the *technology* used to present content. There is a world of difference between text presented on a mobile phone and text presented on a tablet or large screen, even though the medium may be considered the same. It is useful and, from a learner's perspective, valuable to distinguish between media and the technologies used to deliver them. We therefore add "technology" to the list of freedoms. We might use the word "tool" instead, but the popular term "technology" makes it more easily understood in this context.

While our newly added freedom of technology might be comfortably stretched to cover the pedagogies and processes of learning, it may also be valuable to consider the freedom of *method* as a separate category. This requires a little justification. There are many ways that method is inseparable from technology. Indeed, a full definition of any technology must include both the methods and any tools it may employ, and in some cases, the method is the technology. There are strong arguments suggesting that pedagogies, for example, should be treated as technologies (Dron, 2012). However, especially in a learning context, it remains valuable to think of methods separately, especially when we are talking about pedagogies, particularly as populist definitions of technologies tend to focus on the physical tools such as whiteboards, desks, cellphones, and computers, rather than what makes them into technologies. So, although we believe that any full definition of a technology must include both the tools of which it is comprised and the ways they are used, the two are often separable in popular understanding. One can, for instance, use the same tool in many different ways, employing different methods.

Of all Paulsen's freedoms, "access" stands out as being beyond the potential control of an individual or teacher. Access may be denied, for example, due to a lack of qualifications, but can be equally due to limited experience and prior knowledge. This is not a matter of personal choice, or if it is, it is at an entirely different scale from the other freedoms, sometimes relating back to choices made years or even decades ago. Access is not only about prior learning, it also relates to the availability of technology and the ability to use it. However, these are both covered by other freedoms—the freedom to choose an appropriate technology or medium, and the choice of method. Thus, while access is a very important issue, especially in formal learning, it is of a different kind and/or scale to the other freedoms and is not easily controlled by the learner; we therefore exclude it from the list.

This leads us to our own decagon of cooperative freedoms, extending and adapting those identified by Paulsen, illustrated in figure 2.6:

- Place: freedom to choose where one learns
- Time: freedom to choose when one learns
- Pace: freedom to choose how fast or slow one learns

- Medium: freedom to choose the media used for learning
- Content: freedom to choose what one learns, from what source
- Technology: freedom to choose the tools with which one learns
- Method: freedom to choose the approach and pattern of learning
- Relationship: freedom to choose with whom one learns and how to engage with them
- Delegation: freedom to choose whether and when to choose
- Disclosure: the freedom to decide what and to whom it is revealed



Figure 2.6 Decagon of cooperative freedoms (adapted from Paulsen, 2003).

Mirroring Moore's theory of transaction distance, cooperative freedoms are, in many cases, inversely related to one another, though due to the number of freedoms under consideration and the ways they can interrelate, the relationships are more complex. Of particular note, many forms of social learning and freedom of relationship affect and are deeply affected by pace. If we are learning in direct dialogue with others, then the pace of interaction is strongly related to the pace of learning: we have to wait for responses, to work in synchronization with others. Similarly, social interaction may place limits on the potential times and places that learning transactions can occur, as well as the medium, technology, and method used. Likewise, if constraints are placed on relationships, then this may affect freedom of disclosure: for example, if engagement is required as a classroom activity. There is a constant and ever-shifting interplay between constraints and affordances in any sequence of learning transactions, in which technologies, pedagogies, physical and temporal constraints, financial imperatives, prior learning, future needs, methods, and media all help to determine the actual learning path that will be most useful or practical.

Conclusion

Social learning mediated and enhanced on digital networks has much in common with other models of learning, teaching, and associated instructional designs and pedagogies. Ideas and learning activities can be extracted from these other contexts and applied effectively in networked contexts; thus, there is value in extracting ideas and testing their efficacy in them.

In this chapter, however, we have focused on the main families of learning and educational theories that we believe are most directly relevant to the emergent context of networked learning. None of these are exclusive: the most rigidly behaviourist methods of learning have a social context and application, and may be found within learning trajectories that use social constructivist and connectivist models without negating the benefits of either. Connectivist learning often blurs into social constructivist modes as part of the emergent whole, and transactional distance provides a useful way to measure the varying quantities of control and social engagement at any point along the journey.

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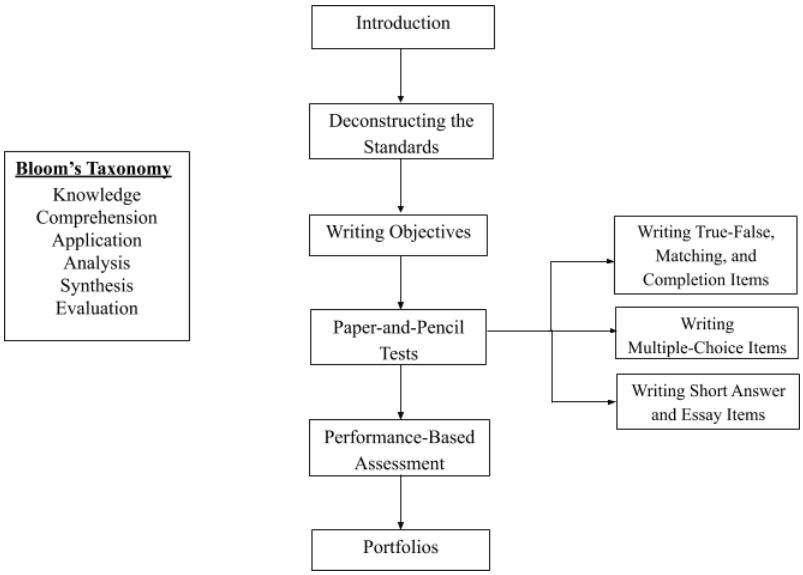
CHAPTER OVERVIEW

12: Module 12- Exploring National Educational Technology Standards

12.1: Introduction
12.2: Deconstructing the Standards
12.3: Writing Instructional Objectives for National Standards
12.4: Daily Living Skills and Employability Training
12.5: Summary, References and Resources
12.6: Professional Development Activities and Exercises

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12.1: Introduction



Much of the academic curriculum in today's schools is dictated by the respective state standards, which are frequently based on national standards, such as those from the Principles and Standards for School Mathematics (NCTM, 2000); the Next Generation Science Standards (NGSS Lead States, 2013); the College, Career, and Civic Life (C3); Framework for Social Studies State Standards: Guidance for Enhancing the Rigor of K-12 Civics, Economics, Geography, and History (NCSS, 2017); and the Standards for the English Language Arts (NCTE and IRA, 1996). However, it is often difficult to translate these standards into in IEPs because of confusion generated by their broad generality and the absence of sufficient direction for their implementation. Hence, some teachers often have a negative view of standards per se.

Our goal in this chapter is to help you modify the wording of any standard into performance terminology and then transmit it into long-term and short-term instructional objectives, all within a progressive sequence of specificity. This sequence can serve as a set of blueprints for classroom instruction. As you know, most reputable contractors would not consider building a house without blueprints, because they provide a basis for ongoing (formative) and conclusive (summative) assessment, and they also enable the contractor to determine whether corrections are in order. Instructional objectives serve the same purpose for classroom instruction.

The litmus test for any instructional objective is whether it provides for objective assessment. Hence, clear language and specific intent should be inherent in every objective at every level. Of course, the level of specificity should increase from national and CEC Standards to long-term objectives- to short-term instructional objectives, and clarity of intent should be vividly present throughout.

Some measurement specialists caution against over adhering to specificity in instructional objectives, fearing that teachers may spend a disproportionate amount of time writing objectives at the expense of preparing for instruction (Harden, 2002). We believe that this is an unwarranted fear.

As we mentioned in the Introduction, virtually all statewide assessment tests are based on state standards, which stem from the national standards. Since these high-stakes tests are criterion- referenced, aligning your lesson plans with them by using our process can enhance your students' performance on these critical examinations. Consequently, your comfort in implementing the standards into your instruction and assessment will result in higher student scores.

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SECTION OVERVIEW

12.2: Deconstructing the Standards

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12.3: Writing Instructional Objectives for National Standards

We begin with sample items drawn from the national standards of the major content and CEC areas, break them down to behavioral terms, and transfer them into long-term and, finally, short-term instructional objectives. This conversation process can be easily applied to the standards of any particular state. We now demonstrate this process for each of the major content areas, as well as the CEC areas of daily living skills and employability training.

Mathematics

Many of the examples used here are paraphrased or taken directly from the *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000). This important document, originally released in 1989 by the National Council of Teachers of Mathematics (NCTM), has been adopted in most states.

The following example is taken from the Measurement Standard for Grades 3-5, a verbatim portion of the actual standard.

> **National Standard**
>
> Each and every student should: use models, benchmarks, and equivalent forms to judge the size of fractions. (p. 148)

First, we modify this standard to include an evidenced understanding of appropriate models, benchmarks, and equivalent forms for determining equivalence.

> **Modified National Standard**
>
> The student will evidence an understanding of appropriate models, benchmarks, and equivalent forms to determine the size of fractions.

We use the term evidence to indicate that the student must show that he/she has met predetermined criteria for fulfilling the standard through observable behaviors. This term is used again in the long-term objective for continuity and to ensure student performance in determining measurements through the discovery of means and tools for measuring complex objects.

> **Long-term Objective**
>
> The student will evidence an understanding of determining the relative size of fractions through the discovery of means and tools for representing fractions.

As you see, this long-term objective includes the original standard while providing for a diversity of means for its fulfillment through short-term instructional objectives. The following objective illustrates how a high level of specificity can still include the components of the original standard.

> **Short-term Instructional Objective**
>
> Given a set of Cuisenaire rods, the student will compare two proper fractions and then state which is greater by orally citing at least one reason for his choice. This objective contains conditions (“Given a set of Cuisenaire rods”) behavior (“state,” “citing”) and minimal standards (“at least one reason”).

Remember, this short-term instructional objective is but one component within the long-term objective that is directed toward the achievement of the national standard.

Science

As with any other discipline taught in Grades K-12, adherence to the respective state standards or *Next Generation Science Standards* is imperative for any teacher of science. Let us demonstrate how broad national and state science standards can be stated in specific terms appropriate for long-term and short-term objectives.

Here is a progression using an actual standard as prescribed in the 5-8 From Molecules to Organisms: Structures and Processes from the *Next Generation Science Standards* (NGSS Lead States, 2013).

> **National Standard**
>
> Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

The complexity and wording of this standard may be confusing and even intimidating to some teachers. However, these translations are easily possible when you follow our steps of conversion. Here is an example of how to deconstruct such standards into logical and understandable guidelines for instruction.

Modified National Standard

The student will demonstrate an understanding of the interrelationships among environmental and genetic factors that influence the growth of organisms.

The verb demonstrates is a precursor of observable pupil performance in the forthcoming objectives. Then, the term interrelationships serves as a connector that brings the disjointed components of the original standard into an understandable whole while still providing for a plethora of long-term objectives, such as the following.

Long-term Objective

The student will demonstrate an understanding of the interrelationships between the growth of fish that inhabit small ponds with those that live in large ponds.

In adherence to the modified standard, this objective uses the verb demonstrate and then specifies and refines some of the previously mentioned relationships. As shown in the following short-term instructional objective, you can use a variety of specific activities for meeting the goal dictated by the national standard and refined by this long-term objective.

Short-term Instructional Objective

Following a class discussion, the student will orally cite three similarities and three differences between the genetic and environmental factors of fish from large ponds compared to those from small ponds.

Continuing the pattern of increasing specificity, this short-term instructional objective is detailed in its partial fulfillment of the original standard. It contains the conditions (“Following a class discussion”), behavior (“cite”), and minimal standards (“three similarities and three differences”).

Social Studies

In 1994, the National Council for the Social Studies (NCSS) released ten broad strands that became the basis for the subsequently published national standards. Building upon this seminal document, the NCSS released a comprehensive update entitled College, Career, and Civic Life (C3) *Framework for Social Studies State Standards: Guidance for Enhancing the Rigor of K-12 Civics*, *Economics*, *Geography, and History* (NCSS, 2017), further explaining that social studies is not a single discipline, but rather a multidimensional collection that encompasses virtually all of the social science disciplines. Understandably, such a broad sweep can be intimidating to teachers who may be puzzled as how to transfer these overarching standards to long-term and short-term instructional objectives in a comprehensible and measurable progression.

The following example is taken verbatim from the Geography Standard of the National Council for the Social Studies (2017) *College, Career, and Civic Life (C3) Framework for Social Studies State Standards: Guidance for Enhancing the Rigor of K-12 Civics, Economics, Geography, and History* for grades 9-12. First, we will modify this example and then translate it into long-term and short-term instructional objectives.

National Standard

D2.Geo.1.9-12.

Use geospatial and related technologies to create maps to display and explain the spatial patterns of cultural and environmental characteristics.

The inclusion of the term spatial makes this national standard somewhat manageable, and it still provides for a multiplicity of long-term and ensuing short-term instructional objectives. However, modification is needed to sharpen its focus.

Modified National Standard

The student will demonstrate the ability to analyze spatial information regarding the Earth’s peoples, places, and environments.

Less confusing than the original standard, this modification focuses on student action. Moreover, it allows for a great latitude of long-term and sequential short-term instructional objectives.

Long-term Objective

The student will demonstrate an understanding of how the population density and relative climate of various regions of the continental United States influence agricultural crop production.

As a partial extension of the original standard, this long-term objective calls for student understanding of how two different phenomena, population density and climate, in various regions throughout the United States impact crop production. Much more specific than either the original or the modified standards, this objective still gives the teacher a great deal of freedom in the construction of short-term instructional objectives for its fulfillment. The following is one such example.

Short-term Instructional Objective

After viewing a film describing crop production in Africa, the student will select a single crop and cite at least two oral reasons why that particular crop would not thrive in her home state.

Detailed and specific, this objective describes the conditions ("After viewing a film"), the behavior ("cite"), and the minimal standards ("at least two oral reasons").

English-Language Arts

The following example is taken word- for- word from Standard One of *The Standards for the English Language Arts* (National Council of Teachers of English and International Reading Association, 1996).

National Standard

Students read a wide range of print and non-print texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world. (p. 27)

This standard provides the teacher with unlimited options but virtually no margins of content coverage. The following modified standard adds focus and direction by including possible media sources, mentioned in the discussion following the standard (pp. 27-28), without altering or diluting the original.

Modified National Standard

The student will read novels, newspapers, magazines, and Web-based resources and engage in the study and creation of visual texts to develop her understanding of text per se, herself, and cultures of the United States and the world.

By suggesting general printed sources and recommending the study and creation of visual texts, the modified standard serves as a conduit for the sharpened focus on the long-term objective.

Long-term Objective

The student will read novels about children from a variety of religions in the United States.

Through his involvement in assigned readings, the student is directed toward the examination of a variety of printed sources, as mentioned in the original standard and specified in the modified standard. Understandably, the latitude of the original standard would not be covered in a single long-term objective. The following short-term instructional objective puts it into lesson plan terms.

Short-term Instructional Objective

After reading two trade books about children from different religious backgrounds, the student, in a conversation with her teacher, will cite at least two similarities and two differences between the two religions, within two attempts.

This objective contains the conditions ("After reading two trade books…, in a conversation with her teacher"), the behavior ("cite"), and the minimal standards ("at least two similarities and two differences, within two attempts.")

Quite specific, the language transfers the original standard into a direct but open and measurable outcome. This objective fulfills the intent of the original standard's dictate of the student's building "an understanding of texts" and "religions of the United States," through its focus and the use of various sources.

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12.4: Daily Living Skills and Employability Training

In 2014, the Council for Exceptional Children (CEC) released the Life Centered Education (LCE) Matrix to embody the myriad of daily living skills and employability training areas contained within special education programs of study. The inherent vastness of this framework can be intimidating to teachers who may be challenged to transfer these broad standards to long-term and short-term instructional objectives in a comprehensible and measurable progression.

The following example is taken verbatim from the Life Centered Education (LCE) Matrix (CEC, 2014). First, we will modify this example and then translate it into long-term and short-term instructional objectives.

National Competency

Buying, Preparing, and Consuming Foods

This national objective provides for a plethora of long-term and sequential short-term objectives. However, modification is need to target the focus into pupil behavior.

Modified National Competency

The student will demonstrate the ability to purchase, prepare, and consume various foods.

Less confusing than the original standard, this modification focuses on student action. Nevertheless, it does allow for a great latitude of long-term and following short-term instructional objectives.

Long-term Objective

The student will demonstrate an understanding of how the unit price of a food item influences the value of the purchase.

As a partial extension of the original standard, this long-term objective calls for student understanding of how unit price is the driving force behind the overall value of the purchase. Much more specific than either the original or the modified standard, this objective still gives the teacher a great deal of freedom in the construction of short-term instructional objectives for its fulfillment. The following is an example.

Short-term Instructional Objective

After observing two comparable food products of different quantities in a store or retail-like setting, the student will calculate the unit price of each packaging to determine the better value, with at least 70% accuracy.

Detailed and specific, this short-term instructional objective pinpoints when the activity is to take place (“After comparing two comparable food products of different quantities”), the particular student behavior (“calculate”), and the minimal standards (“with at least 70% accuracy”). Such specificity provides clear understanding for both teacher and student.

The following example is taken from the LCE Curriculum Matrix, a verbatim portion of the actual standard.

National Competency

Seeking, Securing, and Maintaining Employment

This standard is relatively clear and accessible. However, we can make it more meaningful by including observable evidence of the student’s abilities.

Modified National Competency

The student will demonstrate the skillset to seek, secure, and maintain employment.

We use the term *demonstrate* to indicate that the student must show that she has met predetermined criteria for fulfilling the standard through observable behaviors across the continuum of employment benchmarks. This term is used again in the long-term objective for continuity and to ensure the observable proof that the student is able to demonstrate these critical employability qualities.

Long-term Objective

The student will evidence the ability to use newspapers and Web-based searches to ascertain possible employment opportunities that are commensurate with his skill set.

This long-term objective includes the original competency while providing for a diversity of means for its fulfillment through short-term instructional objectives. The following objective illustrates how a high level of specificity can still include the components of the original standard.

Short-term Instructional Objective

Presented with two different classified advertisements from a regional newspaper, the student will list one possible job for which she is qualified to apply, citing at least two applicable and pertinent qualifications.

Adhering to the long-term objective, this short-term instructional objective is specific in terms of conditions (“Presented with two different classified advertisements from a regional newspaper”), observable behavior (“list one possible job”), and minimal standards of performance (“citing at least two applicable and pertinent qualifications”). Such specificity provides a means for addressing the task dictated by the original competency, the modified competency, and long-term objective. Remember, this short-term instructional objective is but one component within the long-term objective that is directed toward the achievement of the Life Centered Education Curriculum.

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12.5: Summary, References and Resources

Summary

In this chapter we have taken you through the processes that connect and align the national content and CEC Standards with long-term and short-term instructional objectives. Like an engineer or an architect you, the teacher, are allowed virtual freedom within predetermined guidelines. Again, these guidelines are the national, state, or CEC Standards and the ensuing long-term objectives; and your freedom is in your creative construction and implementation of your short-term instructional objectives. Like the engineer and the architect, however, your short-term instructional objectives should be specific and measurable.

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12.6: Professional Development Activities and Exercises

Professional Development Activities

Make certain that you have a copy of the state or CEC standards for the course or courses that you teach. Then break into groups of four or five according to subjects taught.

Together, select a standard and copy it verbatim. Next, modify it by making it more understandable and student-focused. Be sure to include an action verb (e.g., demonstrate) as a precursor of the description of student performance in your long-term and short-term instructional objectives. Remember not to change the content of the original standard by deleting from or adding to it.

Keeping in mind that a number of long-term objectives can stem from a modified standard, cooperatively construct a long-term objective from any part of your modified standard. Be sure to use at least one action verb and present a general description of what you will expect of the student. You can use the content area or CEC samples in the chapter as templates.

Next, construct a short-term instructional objective, selecting a portion of your long-term objective (remembering that many short-term instructional objectives constitute one long-term objective).

Be sure to include an action verb depicting observable pupil performance and mention configuration (e.g., in groups of three or four) and context or preparation (e.g., presented with an unlabeled diagram). Also, it is very important to specify exactly what you expect of each student (e.g., with an error margin of plus or minus five miles).

After you have completed this process, each group can put its four components (national standard, modified standard, long-term objective, and short-term instructional objective) on the board or on the overhead for discussion.

Exercises

1) Which of the following indicates the most specific learning outcome?

A) Behaviorally-stated objective.

B) National standard.

C) Long-term objective.

D) Educational goal.

2) Which of the following resources should serve the greatest role in guiding instruction?

A) Textbooks.

B) Standards.

C) Teacher’s manual.

D) Interest inventories.

3) Which of the following is the most common challenge that teachers face wen translating standards into IEP’s?

A) Understanding the content.

B) Defining the broad terminology of the standard.

C) Outlining assessment accommodations.

D) Noting the requisite technology for adaptive instruction.

4) Content standards, such as those developed by the National Council of Teachers of Mathematics, provide which of the following for teachers?

A) A general framework for developing curriculum specifications

B) Detailed curriculum specifications

C) Specifications of standards of performance for students

D) Comprehensive instructional materials for classroom use

5) Statewide assessment tests are primarily based upon content from

A) Norm-referenced intelligence tests.

B) NAEP (National Assessment of Education Progress).

C) United States Department of Education.

D) State and national standards.

6) What is the most appropriate way to align instruction with state standards?

A) The district chooses textbooks based on the content of state standards.

B) The teacher groups several state standards into a specific leaning objective for a lesson.

C) The teacher breaks each state standard down into specific leaning objective for lessons.

D) The school evaluates teachers on the basis of students' performance on state standards.

7) Which of the following are NOT academic standards representing a learned society?

A) Next Generation Science Standards.

B) Standards for Mathematical Practice.

C) Standards for the English Language Arts.

D) Framework for Social Studies State Standards.

8) Deconstructing the standards allows teachers to do all of the following EXCEPT

A) Determine eligible academic content.

B) Guide instructional decision making.

C) Target instructional interventions.

D) Organize curriculum planning.

9) The Life Centered Education Curriculum outlines student competencies in each of the following areas EXCEPT

A) Daily living skills

B) Driver training

C) Self-determination and interpersonal skills

D) Employment skills

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CHAPTER OVERVIEW

13: Module 13 Evaluating the Impact of Technology on Student Achievement

13.1: Instructional Assessment- Involving Students in the Assessment Process
13.2: What is locus of control? How is it related to student achievement and assessment?
13.3: What are the benefits of students as self-regulated learners?
13.4: How can we help students set goals and monitor their own learning?
13.5: How can early elementary students be involved in the assessment process?
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13.7: How can secondary students be involved in the assessment process?
13.8: When is peer reviewing effective?
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SECTION OVERVIEW

13.1: Instructional Assessment- Involving Students in the Assessment Process

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13.2: What is locus of control? How is it related to student achievement and assessment?

by Lucyna Russell

Learning Objectives

1. Readers will be able to understand what is locus of control.
2. Readers will know the difference between an internal and external locus of control.
3. Readers will learn how locus of control can affect student achievement.
4. Readers will learn what attribution training can do to help an external locus of control.

What is Locus of Control?

Do you believe that you are responsible for your fate or that fate is something that is determined. Depending on your answer can tell you what type of locus of control you may have. Locus of control is a psychological term that was developed by Julian B. Rotter in the 1950's (Neill,2006). Locus of control refers to an individuals beliefs about what determines their rewards or outcomes in life. Individuals locus of control can be classified along a specteum from internal to external (Mearns, 2006).

Note

"Julian B. Rotter has been cited as one of the 100 most eminent psychologist of the 20th centrury. Rotter was 18th in frequency of citations in journal articles and 64th in overall eminence." (Haggbloom, 2002)

What are the Differences Between Internal and External Locus of Control?

A person who has an internal locus of control believes that their rewards in life are guided by their own decisions and efforts (Neill,2006). If they do not succeed at something, they believe it is due to their own lack of effort. For example, a student with an internal locus of control doesn't receive a good grade on his exam. He, therefore, concludes that he did not study enough for the exam. He realizes his efforts are what caused the grade and will have to try harder next time (Grantz, 2006).

A person who has an external locus of control believes that rewards or outcomes in life are determined by "luck, chance, or powerful others" (Mearns, 2008). If they do not succeed at something they believe that their lack of success is due to forces beyond their control. For example, a student with an external locus of control doesn't receive a good grade on his exam. He concludes that the test was written poorly and the teacher was incompetent. He blames the grade on external factors that were out of his control and doesn't see the need to try harder (Grantz, 2006).

Note

- "Males tend to be more internal than females"
- "As people get older they tend to become more internal"
- "People higher up in organizational structures tend to be more internal"

(Neill, 2006)

How does Locus of Control Affect Student Achievement?

There have been a number of studies that conclude that there is a correlation between locus of control and academic achievement. These studies concluded that students with an internal locus of control had higher academic achievement than students with an external locus of control (Uget, 2007). The reason for the internals performing better academically comes from their belief that if they work hard and study, they will receive good grades. Therefore, they tend to study longer and spend more time on their homework (Grantz, 2006). On the other hand, externals believe they have no control over what grade they get. This belief may have been caused by many attempted school assignments that they failed, leading them to have low expectations of studying and school (Grantz, 2006). Any success that they might experience will be rationalized as luck or that the task was too easy. They have come to expect low success and whatever goals they do set are unrealistic (Uget, 2007).

Can an External Locus of Contol be Changed?

When there is a student in the classroom that seems to be having a hard time with his grades and shows no motivation for improvement that student may have an external locus of control. (Grantz, 2006). What can be done to help this student? Is there a way to motivate him? "Attribution training which concentrates on strenghthening the student's internal locus of control, may be helpful in increasing motivation" (Grantz, 2006). Part of attribution training is having say positive things about themselves. Some examples are, "I can do this" or "This can be done with hard work". Students train themselves into believing that they do have the control to change things (Grantz, 2006). Students should be encouraged to associate their academic hardships with the cause of their difficulties as they are being guided to see the effect of their actions (Uget, Habibah, Jegak 2007).

Conclusion

It seems that a persons locus of control can greatly affect their academic achievemnet. The way they perceive themselves and the world around them affects how well they will do in school. It only makes sense that if you work hard and study, then you will do well. However, students with an external locus of control do not feel that way and feel there is no need to try. This, of course, will greatly affect their academic achievement. Although there are ways of trying to change their thinking process, it may not be successful every time. It is important that we encourage our children at an early age and show them that hard work and diligence does make a difference.

? Exercise 13.2.1

1. A student that believes he will get good grades if he works hard and studies has an/a

a. internal locus of conrol

b. external locus of control

c. locus of control

d. strong self esteem

2. A student that fails a test and says it was the teachers fault is said to have an/a

a. internal locus of control

b. external locus of control

c. locus of control

d. low self esteem

3. Caleb is a third grade student who constantly says he cannot do the work, that it is too hard, and refuses to complete his tests would most likely have an/a. locus of control

a. locus of control

b. internal locus of control

c. low self esteem

d. external locus of control

4. Andrea is a fifth grade student who just failed a test. Andrea says to herself that she has to study more next time and try harder. Andrea has an/a. locus of control

a. locus of control

b. external locus of control

c. internal locus of control

d. high self esteem

Answer

1. a
2. b

3. d

4. c

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13.3: What are the benefits of students as self-regulated learners?

By: Jessica Coleman

Learning Objectives

1. Students should be able to identify processes that classify self-regulated learning.
2. Students should be able to recognize the effective strategies of becoming a self-regulated learner.
3. Students should be able to classify the six dimensions of being a self-regulated learner.

Introduction

Technology has brought our society a long way. College students use to attended regular classes on campus in classrooms with the teacher lecturing right in front of them. Technology has brought us so far that college students these days are able to sit at home in their pajamas and take their college classes at online. There are more and more Distance Learning Programs being offered each year from a wide variety of colleges. Many students are choosing to take online courses these days because it allows them more time to complete other tasks, while still working on their education. Online classes is an excellent way for students to obtain their degree. Students that decided to pursue online class must be self-regulated learners. When students are taking online classes there is no teacher in front of them stressing how important it is to stay on target and complete task on time. Students must be organized and motivated to complete their class work on time, therefore students must be self-regulated learners. Self-regulated learning refers to the processes by which individual learners attempt to observe and organize their own learning (Motivation: Self-Regulated Learning, 2009).

Students as Self-Regulated Learners

When we hear the word self-regulated learners we automatically think of students. Did you know that students at almost any age are capable of taking charge of their own learning. The fact that almost all people are capable of self-regulation does not mean that they actually take effective charge of their own learning (Self-Regulation of Learning, 1992). Students have the choice of being a self-regulated learner or not. When taking a distance learning course students can organize a schedule so that they know they will complete their assignments on time. Students can also but their assignments off and be procrastinators instead of self-regulated learners. Students that are self-regulated learners develop more effective strategies to help them with their learning task (Self-Regulation of Learning, 1992).

Note

When faced with a learning task, self-regulated learners typically do the following:

1. They begin by analyzing the task and interpreting task requirements in terms of their current knowledge and beliefs.
2. They set task-specific goals, which they use as a basis for selecting, adapting, and possibly inventing strategies that will help them accomplish their objectives.
3. After implementing strategies, they monitor their progress toward goals, thereby generating internal feedback about the success of their efforts.
4. They adjust their strategies and efforts based on their perception of ongoing progress.
5. They use motivational strategies to keep themselves on task when they become discouraged or encounter difficulties.

Six Dimensions to being a Self-Regulated Learner

There are many other points of views on self-regulated learning and how it relates to students using technology. One view is that students who are active and take control of their own learning at any age level or in any learning situation perform better and achieve better results. Students that already use these tactics must nurture them. Students who have the skills must develop them to be more successful (Self Regulated Learners and Distance Education Theory, 1997). Students in the distance education program will be more successful if they have developed this style because they are more involved in the decision-making that occurs.

Technology allows students to take control of their own learning (Self Regulated Learners and Distance Education Theory, 1997). There are six dimensions to being a self-regulated learner which include:

1. Epistemological beliefs: a person's own understanding of their system of knowing. Knowing about this gives a person the ability to see where they fit into learning or how it influences them. It also influences confidence. The more the learner understands about a particular situation the more success they will experience. Pre-tests or pre-instruction discussion can heighten this awareness.

2. Motivation: The will to learn or get better at learning has to come from internal or external motivation. In the case of the self-regulated learner this motivation comes from recognizing the importance of the task at hand and through personal development.

3. Metacognition: Knowledge about cognition and awareness of one's own thinking and learning. This fits with the use of learning strategies. The student must know what tools they have in the toll box and how well they use them. This creates a more active involvement on the part of the learner as they have to asses the situation based on their own abilities and use the learning skills that they see as appropriate or successful.

4. Learning strategies: Strategies the learner is aware of and how they utilize them. Students need the skills to handle various learning situations. This means a shift from content. To skill development. Giving the student a system of strategies and helping to develop them is a major step towards creating self-regulated learners.

5. Contextual sensitivity: The ability to understand a particular learning situation and how to identify the problem and solve it. This skill can be developed by shoeing the learner how to identify problems. Learners who do not know what they are being asked to solve will never achieve success. They may not know To look for clues or important information contained in the question. Working through examples will build this skill. Have part of the solution to each problem be the identification of what is being asked for.

6. Environmental utilization/control: Use of external resources to achieve solutions. Personal experience and knowledge can add to a person's ability to reach a solution, Learners should be taught to broaden their view of learning to include other resources. Oftentimes events or items we see are not being related provide us with valuable assistance.

Self-Regulation Learning Example

Self-regulation involves developing key processes, setting goals, time management, learning strategies, self-evaluation, self-attributions, seeking information, and important self-motivational beliefs (Becoming a Self-Regulated Learner, 2002). I will provide an example of self-regulated learning to help everyone understand how it effects students in everyday life. The link listed below gives a descriptive example of a self-regulated learning experience.

This link that provides a vivid example of how to become a self-regulated learner: http://findarticles.com/p/articles/mi_m0NQM/is_2_41/ai_90190493/?tag=content;col1

In the example that was presented in this link we are told about a high school student named Tracy who is obsessed with MTV. We are told that she has a very important mid-term math exam coming up in the next two weeks. In this example we are told that she has begun to study for mid-term while she relaxes herself by listening to popular music. Tracy has not set any study goals, she just tells herself to do as well as she can on the test and she will be pleased with that. She uses no specific learning strategies for condensing and memorizing important material and does not plan out her study time. By not having a specific learning strategy Tracy ends up cramming before the test for a few hours. Tracy attributes her learning difficulties to an intrinsic lack of mathematical ability and is very defensive about her poor study methods. She does not ask for any help from others because she is afraid of “looking stupid” in front or her peers. She finds studying to be anxiety-provoking, has little self-confidence in achieving success, and sees little intrinsic value in acquiring mathematical skill (Becoming a Self-Regulated Learner: an overview, 2002).

This example shows us what happens when students are not self-regulated learners. This is an example of what happens when students do not take the time to organize their materials and set goals in order for them to succeed in their studies. This is a perfect example of a procrastinator. Tracy put off studying for her mid-term and she ended up cramming right before the big test and did not do so well. We find that when we put things off, such as studying we do not do so well when it comes time to take the test. This is a perfect example of what happens when students are not self-regulated learners. By reading this example students should learn from Tracy’s mistake and learn how to become a self-regulated learner. If students would become self-regulated learners, cramming before a test would never happen. This is a ideal example for students to read before taking any course. They should realize that they have to be self-regulated learners in able for them to succeed.

Conclusion

After reading all of this important information on self-regulated learners in the distance learning program we should now realize how important it is to be a self-regulated learner. In able for every person to achieve in school they need to be self-regulated learners. Students need to realize that in order to do well in their college classes they need to set goals, maintain time management, develop learning strategies, seek information, and the most important have self-motivational beliefs. If students are self-regulated learners they will exceed in anything they put their mind too. I believe that distance learning programs are great for self-regulated learners and I hope that these programs will encourage more students to be self-regulated learners. Always remember, "Learning is not attained by chance, it must be sought for with ardor and attended to with diligence" (Learning Quotes, 2009).

Exercise 13.3.1

1. There are six dimensions of being a self-regulated learner. Here are five dimensions: Epistemological Beliefs, Metacognition, Learning Strategies, Contextual Sensitivity, Environmental Utilization/Control. Which dimension is the missing?

A. Time Management

B. Motivation

C. Self-Evaluation

D. Setting Goals

2. The first step self-regulated learners typically do when faced with a learning task is

A. They begin by analyzing the task and interpreting task requirements in terms of their current knowledge and beliefs

B. They monitor their progress toward goals, thereby generating internal feedback about the success of their efforts

C. They set task-specific goals, which they use us a basis for selecting, adapting, and possibly inventing strategies that will help them accomplish their objectives

D. They use motivational strategies to keep themselves on task when they become discouraged or encounter difficulties

3. Matthew is studying for his final exam in English which is two weeks away. What skills should he use to make a good grade on his final exam?

A. Set goals for himself

B. Study with other classmates

C. Time management

D. All of the above

4. Ashley has a Science test coming up in five days. Ashley is not doing so well in her Science class. Which choice would not help Ashley do well on her Science test?

A. Ask her peers to help her study

B. Motivate herself by setting attainable goals

C. Manage her time each day so she will have adequate time to study

D. Watch her favorite TV program every night

Answer

1. B. Motivation
2. A. They begin by analyzing the task and interpreting task requirements in terms of their current knowledge and beliefs
3. D. All of the above
4. D. Watch her favorite TV program every night

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13.4: How can we help students set goals and monitor their own learning?

by Elizabeth Donoghue

Learning Objectives

- The reader will be able to explain the benefits for students who set goals and monitor their learning.
- The reader will be able to list strategies to help students set goals and monitor their learning.

Introduction

It's a teacher's dream: curious students, motivated to learn, are each reveling in their own progress. Rewind to a common scene where students are daydreaming, heads on desks, while a teacher is expounding on the importance of knowing the dates of Civil War battles. How can a teacher avoid inactive students and create a dream classroom with students involved in their learning? This article will describe ways to involve students in setting their own learning goals and monitoring their own progress.

The Active Learner

Rick Stiggins and Jan Chappuis (2005) from the Assessment Training Institute in Portland, Oregon, have emphasized the importance of involving students in setting their own learning goals and monitoring their own progress. "When [students] are involved in collecting evidence of their achievement, charting their growth, and setting goals for future learning, students develop insight into themselves as learners. In addition, both the achievement and their commitment to learning increase" (Stiggens & Chappuis, 2004, in Condition #4 section).

In order to begin to set personal learning goals, Chappuis suggests having students ask themselves, "Where am I going? Where am I now? and How can I close the gap?" (Chappuis, 2005, p39). Chappuis (2005) suggests seven strategies to help teachers create assessments that help students learn:

- 1. "Provide a clear and understandable vision of the learning target.
- 2. Use examples of strong and weak work.
- 3. Offer regular descriptive feedback.
- 4. Teach students to self-assess and set goals.
- 5. Design lessons to focus on one aspect or quality at a time.
- 6. Teach students focused revision.
- 7. Engage students in self-reflection and let them document and share their learning."

(Chappuis, 2005, pp. 40 – 42)

Setting Goals

Having students set their own goals is easier said than done. In fact, many students find it difficult to set their own goals. McDevitt *et al.* (2008) found that middle school students wanted help setting goals that were not too easy and not too challenging. Schleomer and Brenan (2006) also found that college professors needed to guide college freshmen in setting goals that contained the right amount of challenge.

Rather than assume that students know how to set goals, Rader (2005) suggested that schools teach students exactly how to set goals. "Schools are labeling record numbers of students as attention deficit disordered (ADD), because those students are unable to focus, and yet the schools spend virtually no time teaching those students how to focus. Because goal setting is a crucial skill for success, it needs to be introduced" (Rader, 2005, p. 123).

Note

"Goal Setting for Students and Teachers: Six Steps to Success"

- 1. "Choose a specific goal and write it down.
- 2. Decide a time when your goal will be achieved.
- 3. Develop a plan to achieve your goal.
- 4. Visualize yourself accomplishing your goal.
- 5. Work hard and never give up.

- 6. Self-evaluate."

(Rader, 2005, pp. 124 – 125)

Tips and Ideas for Goal Setting and Self-Monitoring

Here are a few ideas which may help teachers guide students in setting goals and monitoring their learning:

- Give the students a list of the school's established learning targets, so each can choose one as his or her own current goal. (Schloemer, 2006)
- Use a traffic light concept to let students indicate how much help they need. Green = I'm going along fine … Yellow = I'm a little confused … Red = I'm stuck. (Chappuis, 2005).
- Have the students list their strengths and what they need further work on before they turn in an assignment, so that they will be monitoring their own learning (Chappuis, 2005).
- Well before a test, have students list what they will be tested on, what they know well already, what they still feel uncertain about, and a plan for preparing for the test (Stiggins & Chappuis, 2005).
- Have students set a classroom goal, such as reading a certain number of books per month, and monitor it, in order to demonstrate goal setting (Rader, 2005).

Note

Making Math a Winning Event

"Gail is a 5th grader who gets her math test back with '60%' marked at the top. So her losing streak continues, she thinks. She's ready to give up on ever connecting with math.

… But then her teacher distributes another paper – a worksheet the students will use to learn from their performance on the math test. … Column one lists the 20 test items by number. Column tow lists what math proficiency each item tested. The teacher calls the class's attention to the next two columns: Right and Wrong. She asks the student to fill in those columns with checks for each item to indicate their performance on the test. Gail checks 12 right and 8 wrong.

The teacher then asks the students to evaluate … if they made a simple mistake … or if they really don't understand what went wrong. Gail discovers that four of her eight incorrect answers were caused by careless mistakes that she knows how to fix. But four were math problems she really doesn't understand how to solve.

Gail discovers that all of her wrong answers that reflect a true lack of understanding arise from the same gap in her problem-solving ability: subtracting 3-digit numbers with regrouping.

The teacher then provides differentiated instruction to the groups focused on their conceptual misunderstandings. Together the class also plans strategies that everyone can use to avoid simple mistakes.

When that work is complete, the teacher gives students a second form of the same math test. When Gail gets the test back with a grade of 100%, she jumps from her seat with arms held high. Her winning streak begins"

(Stiggins, 2007, "Scenario 2" from Stiggins, Arter, Chappuis, & Chappuis, 2004).

Explanation

In this scenario, Gail initially received only a letter grade as feedback for her test. However, the teacher has Gail evaluate her performance on the test, and categorize the type of math concepts she understands well and those she needs more help with. She then sets a goal based on the results of this test, and determines the concept she needs more help with and also that she needs to beware of careless errors. Focused teaching then helps Gail to get the extra instruction she needs. On the next test, Gail shows that she has met her learning goals.

Evaluation

Gail's experience with math testing and instruction is a good example of helping students to set goals and monitor their own learning. The teacher has guided her to evaluate her test so she knows which skills she has mastered and which she still needs work on. She has set a goal for learning a math concept based on this evaluation, and she has focused her learning, with the teacher's

guidance, on her weak areas. The second test allows for a new assessment of skills. Hopefully, as the year goes on, Gail will be able to evaluate her performance with less guidance from the teacher and will continue to set goals on her own.

To improve this scenario, the teacher could include a chart of some kind to help Gail monitor her learning over time. In addition, starting the year out with Rader's (2005) goal setting skills training would help the students understand the process of goal setting more completely.

Conclusion

By including goal setting and self-monitoring in the daily classroom routine, a teacher can create a learning environment that increases student involvement and motivation. (Stiggins & Chappuis, 2005) It is interesting to note that throughout this process, students continue to set new goals frequently as they monitor their own learning. Teachers and administrators need to be familiarized with student goal setting and self-monitoring so that they can use it and intentionally teach it to their students (Stiggins, 2007). Once students begin to use this method, they will become more in charge of their own learning.

? Exercise 13.4.1

1. What is NOT an expected benefit to students who set goals and monitor their own learning?

a. The students will achieve more.

b. The students will be more motivated.

c. The students will get A's on all tests.

d. The students will understand their learning needs.

2. Which is a strategy will help students to understand what their learning goal is.

a. Give the students a report card each semester.

b. Provide examples of strong and weak work.

c. Remind the students about the test at the end of the chapter.

d. Tell the students what mistakes they made.

3. Mrs. Tiggs teaches 1st grade. She notices that the students are not remembering new reading words she has taught. She wants to motivate them to practice their new reading words so they will retain them better. What can she do to motivate them to work hard on the goal of learning the new words?

a. Give A's on the report card to students who learn their words.

b. Keep reading the same stories until they learn the words.

c Let students add their words to a poster when they can read them to the teacher 5 times.

d. Send home letters to the parents of students who are not learning their words.

4. Ms. Nelson is the principal of a middle school who wants to motivate her students to learn. Her teachers complain that the students seem to do fine on homework, but do not seem to master the material for the test. What strategy would she NOT suggest to the teachers.

a. Guide the students to list what topics they need more study on.

b. Have the students chart their progress on practice tests.

c. Keep students after school if they fail the final test.

d. Teach the students to set goals.

Answer

1. c
2. b
3. c

4. c

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13.5: How can early elementary students be involved in the assessment process?

by Courtney Townsend

Note

- Be able to clearly define assessment.
- Explain how student-involvement is beneficial towards the assessment process.

Introduction

As aspiring teachers, it can be a bit unnerving to determine the best way of evaluating and testing our students adequately. With student involvement, the assessment process can be geared towards meeting the needs of students. In early elementary school, input from younger children helps teachers form assessments that help to evaluate their student's strengths and weaknesses in order to adjust their teaching methods for their class.

What is assessment?

Assessment is an evaluation that can test what students have retained not only after they were introduced to the information but also *while* they are learning the information. The University of Northern Iowa's Higher Learning Commission explains assessment in a more in-depth manner:

“Assessment of student learning is a participatory, iterative process that:

- Provides data/information you need on your students’ learning
- Engages you and others in analyzing and using this data/information to confirm and improve teaching and learning
- Produces evidence that students are learning the outcomes you intended
- Guides you in making educational and institutional improvements
- Evaluates whether changes made improve/impact student learning, and documents the learning and your efforts" (UNI, 2006).

All of these key points influence what it takes to form a well-devised and efficient learning assessment.

How should teachers integrate assessment into the classroom?

Choosing the best way to evaluate students and choose an assessment FOR learning can sometimes take a lot of trial and error. It can be challenging at times to devise a way of testing a student's *application* of knowledge and not just test knowledge itself. This can be avoided using performance-based testing which, according to the online-journal, *Practical Assessment, Research & Evaluation*, "require individuals to apply their knowledge and skills in context, not merely completing a task on cue" (Brualdi, 1998). Some teachers get nervous about using performance-based assessment because they are nervous about the affects of letting students do activities while they are learning, rather than waiting at the end of a lesson to do testing. For those who are skeptical, this advice is given: "The key for the instructors is to understand how the process works, take some precautionary steps to smooth out the bumps, and wait out the inevitable setbacks until the payoffs start emerging" (Brent & Felder, 2006). In order to try integrating assessment, it is best to consider how well you think your students will react and choose an activity that will best suit their needs as a whole.

Note

There are some things that you must take into account before you choose the activity: time constraints, availability of resources in the classroom, and how much data is necessary in order to make an informed decision about the quality of a student's performance (Brualdi, 1998).

How can student-involvement be used in Elementary School?

For young elementary school students, using tests that assess only their knowledge of what they have learned can sometimes cause students to memorize what they have learned rather than use what they have learned in a task. It can be very rewarding to have their input when it comes to devising an appropriate performance-based assessment. Teachers can gain input of what their students wish to try for an assessment by taking surveys of their opinions or simply having them raise their hands and vote on different

options for assessment. Especially for young elementary-age students, it is important for them to have clear and concise instructions so that they will know what is expected of them and be able to participate appropriately.

Assessments can be formal or informal. Getting a students input concerning rubrics can be a great way for them to know ahead of time what they need know or pay attention to if they participate in the rubric-making process. According to Amy Brualdi, "You can engage students in this process by showing them examples of the same task performed/project completed at different levels and discuss to what degree the different elements of the criteria were displayed" (Brualdi, 1998).

Conclusion

When it comes to assessments for elementary school students, it is always best to experiment with different ways in order to find the best one for you and your students. It is always helpful and beneficial to get your students' opinions in order to hear their desires for their ideal performance-based assessment. Letting students be a part of your work is a rewarding way of getting to know them better in addition to seeing them shine throughout tasks that they are given.

Exercise 13.5.1

1. Which of the following do assessments NOT achieve?

A. Engages you and others in analyzing and using this data/information to confirm and improve teaching and learning.

B. Provides data/information you need on your students' learning.

C. Critique every mistake a student makes.

D. Produces evidence that students are learning the outcomes you intended.

2. What factors help a teacher choose an appropriate activity for an assessment?

A. time constraints

B. availability of resources in the classroom

C. how much data is necessary to evaluate a student's progress

D. all of the above

3. A student who is completing an activity that shows what they have learned is doing which of the following?

A. performance-based assessment

B. formal assessment

C. informal assessment

D. summative assessment

4. Involving students in the assessment process is beneficial to their learning.

A. true

B. false

Answer

1. C
2. D
3. A
4. A

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13.6: How can upper elementary students be involved in the assessment process?

By: Erica Corbett

Learning Objectives

- Readers should be able to identify the differences between a formative assessment and a summative assessment.
- Readers should be able to discuss the effects of different techniques of formative assessment used for assessing middle school students in a diverse environment.

Introduction

When most people hear of assessments, the first kind of exams they would think of is those that will test a student's knowledge of a subject. However, that is not always the case. Assessments are used not only to test one's knowledge of a subject, but to track how far along a student is, how far they need to go, and how to get to their optimal destination. In this article one will identify different assessment types and different assessment techniques used for children at the middle school or upper elementary level.

Summative vs. Formative Assessments

There are two major types of assessments, summative and formative. According to Creating Literacy Instruction for All Students, "Summative assessment summarizes students' progress at the end of a unit or a semester or at some other point in time". Statewide exams such as the SOLs are considered summative exams because it assesses the student's knowledge and occurs after the student has learned the required materials. This kind of exam is used for accountability purposes. This holds the student, teacher, and even the state accountable for progress of the student. An example of a summative exam can be found here http://www.virginiasol.com/test/1861.htm.

Formative is the other type of assessment. Formative assessments occur while learning is still going on. According to Creating Literacy Instruction for All Students, "Formative assessments can be powerful and is especially helpful for struggling learners." This kind of exam helps the student and teacher prepare for summative exams. Examples of formative exams include, practice quizzes, essays, and rough drafts. This allows the student and teacher to track progress and to correct mistakes. One major difference between summative and formative assessments is the notion of feedback. Feedback, which is very vital for formative assessments, is very important concerning student growth. This is very important because, it allows the student to become more aware of where they are, how far they need to go and what it takes to get there.

Formative Assessment Techniques for Middle School Students

Note

> The increased diversity in the nation's classroom has prompted much attention to the challenges associated with educating multicultural, multilingual student population
>
> - D. Darling and H. Hodges

As the country becomes more diverse, the types and the deliverance of assessments have become very important for instructors, especially at the middle school level. The teacher would not only have to focus on how to deliver the lesson to English speaking students from similar backgrounds, but also to those who do not speak English from very different backgrounds as well.

Barbara Allison and Marsha Rehm, both conducted a study within the Florida school system to determine what kinds of assessments are highly effective in diverse middle school classrooms. The state of Florida was chosen as the model for diversity within the school system because, 50% of students within the school system are members of an ethnic minority group(www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/36/29/23.pdf) According to the study, visuals, cooperative learning, and peer tutoring were considered highly effective methods of formative assessments for the Floridian teachers. Visuals are considered highly effective because it is a "universal language" regardless of background or language. Anyone can understand what an apple looks like or what numbers can entail. This is a perfect example of how formative assessment is universal for all students regardless of background.

According to Saravia-Shore and Garcia, Snowman and Bieler, the peer tutoring strategy within a diverse setting is “very effective when two students from different backgrounds are paired together” . This and the cooperative learning strategy are very effective because the students have to depend on each other to get ahead. This will entail the students to understand their differences and for non English speaking learners, to break the language barrier.

Conclusion

Formative Assessment techniques are very important within the classroom. As the country becomes more diverse, these kinds of assessments have accommodate every student in the classroom regardless of background or English level capacity.

? Exercise 13.6.1

1. Which of the following is considered a summative assessment source?

a) Rough Drafts

b) Statewide Exams

c) Practice Quizzes

d) Essays

2. What is the use of a Formative Assessment?

a) to track the progress of the student

b) to assess what the student has learned at the end of the year

c) to prepare for the summative exam

d) both a and c

3. Ms. Thompson decides to use the method of peer reviewing to emphasize the notion of correct grammar in her class. According to the article, which pairing would be most effective?

a) an English student with another English student

b) a non speaking English student with an English student

c) a non speaking English student with a non speaking English student

4. After the peer review exercise, Ms. Thompson decides to use a technique that is "universal" to every student regardless of their background? Which technique should she use?

a) peer review

b) cooperative learning

c) visual aids

Answer

1. b
2. d
3. b
4. c

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13.7: How can secondary students be involved in the assessment process?

by: Dbrod001

> **Note**
>
> Effective instruction depends on sound instructional decision-making, which, in turn, depends on reliable data regarding students' strengths, weaknesses, and progress in learning content...
> (National Institute for Literacy, 2007, p. 35)

Learning Objectives

- The reader will be able to identify different forms of assessment in a high school setting.

Introduction

One of the biggest tasks high school teachers undertake is to successfully assess their students in a manner that is helpful to both students and professionals. The problems with achieving this goal include differing opinions on what kinds of assessments offer better feedback for students and teachers, and which forms of assessments more accurately test students. The main focus of the argument is the two different forms of assessment: summative and formative.

Assessing the Student

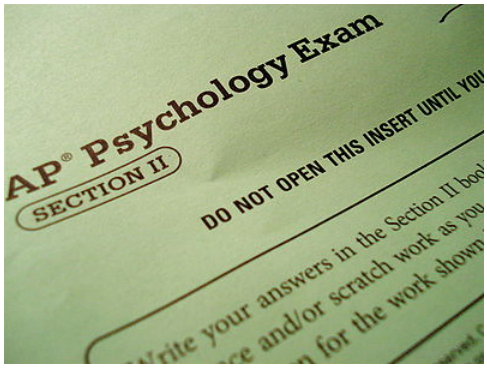


Figure 13.7.1: The AP Psych Test, Section II Free Response Booklet. This is returned to students two days after the exam's conclusion. (GFDL, Alton Wikimedia)

Summative vs. Formative

One side of the argument is summative assessment, with the focus being mainly on formal tests such as standardized tests, final exams, chapter tests, etc. These types of tests are usually given at the end of a certain period, and the student is given a final grade.

A major drawback to this type of assessment is that "…they do not inform daily instructional decision-making, nor do they provide information on individual student progress" (Hall & Adams, 2007).

The other form of assessment is formative – a more informal way of testing student knowledge by means of peer reviewing, practice quizzes, class surveys, etc. Formal assessments are usually given so student progress can be monitored by both teachers and students before formal tests are taken.

One flaw with formative assessment is whether or not it accurately depicts what the student is retaining in the classroom. As Hall & Adams argue, "…there is still a need in our case for continued test development to determine if the high pretest scores were the result of test questions that were too easy, testing common knowledge, or testing material students have learned in a previous course" (2007)

Involving the Student

There are many different ways to involve students in the assessment process. One is peer-to-peer assessment, which is when students review and critique their classmate's work. An example of peer-to-peer assessment would be in a group setting. The class grades each other based on performance, involvement, and helpfulness, thus contributing to each other's individual grade. In this

setting, students depend on each other for their grades. A drawback might be that some students will grade with a bias, or will not be honest in their assessments.

Another way to involve students is to have them assess their own individual works. This technique allows students to see what areas they need to improve in and where their strengths lie. Again, the issue of honesty pops up when students are left to grade their own work. One way for a teacher to counter this would be to review the student's assessment and provide a reward based on their honesty.

Example

Example

The example above is a rubric used in public schools in San Bernardino County, California. It can be used both for the teacher and the students to grade each other for group presentations. The rubric assesses how well the student is prepared for the presentation, and how effective the presentation is.

Based on my research, I think this is a good example of an assessment rubric if the class were a public speaking class. Because the rubric does not specifically grade the student on how well he or she knows the course material, I do not think it is providing proper assessment and feedback for any other class.

Exercise 13.7.1

1. Which of the following is NOT a form of assessment?

   A. Formative
   B. Instruction
   C. Performance
   D. Summative

2. Ms. Smith had assigned her students an essay, and offered a rubric that the essay will be graded against. When the time comes to turn in the essays, Ms. Smith informs her students that they will be grading their own work based on the rubric previously given. What form of assessment is Ms. Smith executing?

   A. Formative
   B. Peer-to-peer
   C. Performance
   D. Solo/Individual

3. What is "performance assessment"?

   A. A nation-wide test that students must take
   B. Students grading their own work individually
   C. When students assess each other's work
   D. When students are assigned group work

4. Which of the following gives the BEST example of involving students in the assessment process?

   A. Collaborating with the teacher to create fun activities
   B. Evaluating each other's individual effort in a group project
   C. Playing games that help reaffirm the learning targets
   D. Taking a cumulative exam at the end of each chapter or unit

Answer

1. (B)
2. (D)

3. (C)

4. (B)

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13.8: When is peer reviewing effective?

By: Brittney DeShazo

Learning Objectives

- Students should be able to identity the positive effects of peer review
- Students should be able to identify the criticisms of peer review
- Students should be able to determine a situation where peer reviews would be appropriate

Introduction

Think of all of the different ways to assess students. How many are the students actually involved in the process? Peer reviewing allows student assessment of their peer's work. If used correctly, it can benefit the student who is being assessed, as well as the one who is doing the assessing. It is a way to provide feedback that is more reliable to the students. Students will be able to interact with one another as well a judge if an assignment meets the appropriate criteria.

Who Uses Peer Reviews?

Peer reviewing can be a way to judge students on the quality of their work. However, peer reviewing as a variety of uses in many different areas of study besides education. Many scientists and other professional use peer reviewing as a tool to help them create high quality work. According to an article published in Nature ,a weekly science journal, peer reviewing acts a filter (Nature, 2006). It can be a way to help eliminate bias, and other distracting information from a report. Even though we regularly might not think about it but, the United States Government also uses different forms of peer reviewing in many of their legislation procedures. For example, the Department of Education uses peer reviews to help identify if certain school programs are meeting the requirements of the NCLD (Standards and Assessments Peer Review Guidance, 2007). The secretary of Elementary Education reviews various plans for the improvement of educational practices in many different school systems. Sate records, test administration manuals, and school board resolutions are reviewed to make sure they meet the requirements. A board of qualified people actually sits down and reviews the results, the final results are then used for improvements in the educational system. Peer reviewing in being used in a variety of different fields as way to make sure the product is on track with the overall goal. Essentially the students who use the peer review process are doing the exact same thing as the officials who are leading our country, just on a smaller scale.

Benefits of Peer Reviews

How does peer reviewing help assessment? Well for starters, peer reviewing encourages interaction between students. It allows students to communicate and share their opinions with their peers. Secondly, more than one person benefits from the process of peer previewing. Think about it. The student, who does the assessing, learns what characteristics will make the final product successful. The one being assesses learns how to make improvements. It can essentially be a win-win situation for both parties if done correctly (Bostock, 2002). In an article by Brown, Rust, and Gibbs, provides a very nice list of all of the potential advantages of peer reviewing (Brown, Rust and Gibbs, 1994).

Note

Potential Advantages of Peer Reviewing

- Giving a sense of ownership, improving motivation
- Encouraging students to take responsibility of their own learning, developing them into autonomous learners
- Treating assessment as part of learning, so that mistakes are opportunities rather than failures
- Practicing transferable skills needed for life-long learning, and evaluation skills
- Using external evaluation to provide a model for internal self-assessment of a student's own learning
- Encouraging deep rather than surface learning.

All of these skills and techniques that could be learned during the peer review process are important in student development. The student will become more comfortable in dealing with criticisms. The student also has the potential to become more effective at delivering criticisms to a peer or future co-worker. Not all peer reviewing is done in the exact same way. Some peer reviewing is

done on a more individual level, while others are on a more group level. Whatever method is used peer reviewing can be used an effective way of assessment.

Please click on the link provided for an example of a peer review assessment sheet that could be used in a classroom. [1]

Evaluation: This type of peer reviewing assignment would be used in a science class. I think it would be best used with middle school aged children. By that age they can handle the requirements of assessing a peer's report. This peer review makes the student who is doing the assessing really become aware of more than just that topic of the report. He or she will also have to make sure the report meets grammatical standards. This model of how peer reviewing can be use effectively in a classroom really combines more than one subject area, which is important.

Criticism of Peer Review

Like with all things, there are two sides to this story. Just as peer reviewing has its' supporters it also has its' critics. As mentioned by the Nature article, peer reviewing can produce only a minimal source of quality (Nature, 2006). There is really no way making something 100%. One can find all of the errors in a particular piece or work but, there is no way it can be perfect. The same article also brings up the issue of time. The peer reviewing process can be very time consuming (Nature, 2006). One of the major criticism with this method of assessment is favoritism. It is very hard to prevent the assessor from having some skewed judgments. If the assessor knows the person who he or she is assessing, then it can lead to some misleading results (Nature, 2006). What this ultimately does is create biased results (Bostock, 2002). A study done in 1993 suggested that if the students do not have any knowledge or connection to the article they are assessing, they are more likely to score that article more honestly (Bostock, 2002).

Conclusion

Peer Review is a way to assess students, as well as to get them involved in the assessment process. Although there are some criticisms there are also some positive aspects that are helpful in the assessment process. Peer review is an innovative form of assessment. Students gain insight about their own work, while looking at examples provided by other students. If used correctly, peer reviewing can be a very reliable type of assessment.

? Exercise 13.8.1

1. Which of the following is not an advantage of peer reviews?

a. Encourages students to take responsibility for their own work.

b. It is easy, and does not require a lot of time.

c. Mistakes are looked at as opportunities rather than failures

d. Practicing life long evaluation skills

2. How do peer reviews act as a "filter?"

a. Allows the article to be concise and to the point

b. Allows the project being assessed to include some of the author's opinion

c. Allows the article to be filled with statistics

d. Allows the article to be read quickly.

3. Mrs. Smith decided to allow her fifth grade class to use reviews as a way of assessing her students for a history report. Sandy and James were paired together to review each others' work. James is good at grammar. Sandy is strong at determining the organization of the report. How will peer reviewing be beneficial for both partners?

a. James gets to practice hi grammar skills

b. Sandy will get a higher grade because James is able to help her with her grammar.

c. Sandy learns how to improve her grammar skills, and James gets to work on the organization of his report.

d. They do not benefit at all from using peer review as an assessment.

4. Why is it important to consider peer reviewing as a way as assessment?

a. Important issues are addressed in the reports, articles, etc.

b. To make sure that the article or assignment meets the requirements.

c. To reduce the amount of bias in a published or graded work.

d. All of the above

Answer

1. b
2. a
3. c
4. d

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13.9: Can and should students grade each other?

By Brittany Bowman

Learning Objectives

1. Understand what peer assessment is.
2. Understand the pros and cons of peer assessment.

Introduction

Teachers across the United States have been progressively been using more and more cooperative learning strategies. Of the many cooperative learning techniques and strategies being put to use within the classroom, teachers seem to favor one in particular: peer assessment. Peer assessment is when students evaluate the work of their fellow classmates with the best of their ability to provide helpful solutions or hints and to correct mistakes. Also, by doing so, the students are ultimately receiving an insight into their own work.

Note

"Learning is a social process that occurs through interpersonal interaction within a cooperative context. Individuals, working together, construct shared understandings and knowledge." (Johnson, Johnson, & Smith, 2004)

Although students benefit from getting their work evaluated by their peers and being able to correct it before finally receiving a grade from the teacher, there is one question that still remains: can and should students grade each other's work?

Pros

There is good reasoning for those who believe that students should be able to assess one another's work. The process of peer assessment shows that it can be very beneficial and it shows that there are many advantages in allowing students to evaluate each other's school assignments.

- One of the biggest benefits to peer assessments is the fact that the students are given the chance to edit and correct all errors from the feedback given by the peer reviewer before the teacher gives the assignment a final grade (Froyd, 2002). Allowing students to 'perfect' their paper or assignment, gives the student a better chance at receiving a better grade.
- As students review their peers works, they begin to see insight into their own work. Peer editing or reviewing gives the students guided practice, which in turn, sharpens their comprehension of the material (Froyd, 2002). Also, by reading other peers' work, it could inspire new thoughts or ideas that could be used to improve their personal performance.
- To some degree, the students within the classroom gain communication skills with one another through this experience of peer assessment. Through this process, students learn how to clearly give feedback and how to effectively use and incorporate the feedback they receive (Froyd 2002).
- Time is valuable to both the teacher and the student. Grading assignments can be very time consuming for one teacher to handle. Using the peer assessment process can act as a solution to this problem. "Peer assessment affords students much more immediate and frequent feedback than one instructor can possibly provide" (Nilson, 2003). Having enough time to correct the mistakes is key and the whole reason why peer review or assessment exists in the first place.

Cons

Those with opposing viewpoints have an entirely different perspective on how ineffective peer assessment could potentially be for the students. There are many reasons how this cooperative learning strategy could work against itself and not give the students the proper feedback necessary for improvement.

- Emotions and loyalties play an immense role in how peer assessment, which seems to be a perfectly suited process, can worsen or even fail. Students assigned to evaluate a close or faithful classmate, might be very hesitant or cautious to provide essential feedback needed to fix the mistakes, in fear of hurting their friend's feelings. On the other hand, students assigned to evaluate a classmate that they dislike, might cause the peer reviewer to be more harsh than helpful (Nilson, 2003). In this case, the peer assessment process would backfire and would ultimately cause more work for the teacher.

- Students acquire knowledge at different rates and process the knowledge on different ability levels. Students that are at lower ability levels may not be able to contribute proper feedback that could be used beneficially (Nilson, 2003).
- Other students might not put forth enough effort or as much effort as their fellow classmates, which would put the work being evaluated at a disadvantage (Nilson, 2003). These students could make careless mistakes while trying to fix the current mistakes.

Conclusion

Peer assessment can be very beneficial for both the teacher and the student when the proper guidelines are provided. If the students evaluate each other's work with their best ability, then the students are able to get the feedback that they need with enough time to fix the errors before the assignment is given a final grade by the teacher.

? Exercise 13.9.1

1. Which of the following is not considered a benefit of using the peer assessment process?

a. Peer assessment gives the students enough time to fix the errors.

b. Peer editing gives the students practice which can sharpen their comprehension.

c. Students learn at different ability levels.

d. Students see insight into their own work.

2. Why do emotions and loyalties play an important role?

a. Students assigned to evaluate a classmate that they dislike, might cause the peer reviewer to be more harsh than helpful.

b. Students assigned to evaluate a close or faithful classmate, might be very hesitant or cautious to provide essential feedback needed to fix the mistakes.

c. The students do not put forth enough effort.

d. Both a and b

3. Grading papers can be very time consuming and Mr. Fuller recently assigned his class a research paper, where the students have to choose a battle taken place during the civil war. The assignment is worth 40% of the students' overall grade, and the students are expected to do their absolute best. How should Mr. Fuller go about to make sure the students get proper feedback before submitting their paper in for a final grade?

a. He should only give the students a rubric and let them figure the rest out on their own, hoping for the best.

b. Mr. Fuller should give all the students A's, which reduces time and the students will benefit by getting a good grade.

c. Peer assessment can be used being very beneficial for both the teacher, which reduces the time needed and to the student when the proper guidelines are provided.

d. Since time is so valuable, instead of taking the time to give the students grades, Mr. Fuller decides to grade based on the grades given to the students on past assignments.

4. Billy's mom is a single parent that works two jobs to make ends meet. As a result she spends most of her time trying to make enough money to pay the bills and little time at home. Billy has been doing all his work, but because he lacks a parent to review over it before submitting it, errors are not found or fixed. Billy's teacher, Mrs. Powell, has noticed that his grade is suffering and wants to try to help. What should Mrs. Powell do?

a. By allowing time in class for students to assess each other's work, Billy would be able to fix the errors before submitting it for a final grade.

b. Call Billy's mom and complain about how she is being a bad parent.

c. Ignore Billy's situation because she thinks that it is rude to intrude in his home life when it is none of her business.

d. Mrs. Powell should do nothing, which could result in Billy failing the class and end up having to take it over again.

Answer

1. C

2. D
3. C
4. A

References

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CHAPTER OVERVIEW

14: Module 14- Using Technology to Enhance Engagement in Learning Activities

14.1: Implementation Issues

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14.1: Implementation Issues

Some of the factors you need to take into consideration when implementing an LMS are:

1. Change management: Implementing an LMS is a major change. In a corporate environment almost everyone will be exposed to it as it becomes part of the intranet portal. The change management issues—the marketing, communication, and training initiatives that will need to be put into place to gain acceptance and appropriate use—are of paramount importance. In an educational institution, the impact will be less widespread, but change management is still important for all the instructors and students who will be accessing the system.
2. Timelines: How long will it take to conduct a needs assessment, to run a pilot test, to build a user community within the organization, to build the appropriate infrastructure to support it, etc.?
3. Cost: Consider the total cost of ownership (TCO); not just the cost of the software but the complete implementation and maintenance costs.
4. Customization: Will you want to brand the system or change it to make it conform to the way you do things? Doing this can be more expensive than the initial licensing and can delay the implementation process significantly.
5. Internal or external hosting of the application:
    - In-house hosting requires hardware (e.g., servers for application, database, data storage, backup systems), infrastructure (e.g., high-bandwidth connectivity, uninterrupted power supply in case of power outage), and staffing (e.g., technical support staff, training, and user support staff) to maintain the LMS. In some cases, in-house hosting can provide your organization with greater flexibility, security and responsiveness than a third-party hosting facility.
    - With the supplier or a third party hosting it for you, it is more expensive, but you do not have to provide all of the IT support. In most cases, however, you will still need to designate or hire an in-house support person to support instructors and learners, and to be the point of contact with the hosting group. Implementation of externally hosted LMSs can be quicker. It may, however, take longer to make changes in the system after it is up and running.
    - With open-source systems, it may be possible for you to contract with a company to host and maintain the LMS for you but the usual scenario for these will be in-house hosting.
6. Integration with other systems, e.g., registration, student information systems, library or data management systems, and/or human resources systems
7. What kind of support will the supplier or community (for open-source solutions) provide during implementation? For example, training, customization, trouble shooting, help desk, etc.
8. Training for instructors and students
9. Software updates
10. Conversion of existing or third-party courseware to run properly on your new LMS.
11. Are there other initiatives happening in your organization which your LMS initiative can support so that mutual success can be achieved?

Case Studies

Telus case study and e-learning success story: it's about access

Telus Communications is western Canada's major telecommunications provider and the second largest in the country. It has approximately 25,000 employees across the country. Between 1995 and 1998, BC Tel (prior to the merger with Telus) developed an extensive intranet which became a great information tool for employees. Several internal websites were developed to augment the training courses offered by Learning Services. In 1998, BC Tel contracted with SkillSoft for about 20 of its generic, self-directed sales and communications courses to complement its manager training curriculum. The initial licence was for 2,000 participants. The interest was much greater than expected. Many employees at all levels of the organization and in all divisions discovered the courses and used the opportunity because they were "free". Within six months, the licence had to be increased to 3,500. Then additional courses were licensed for other subject areas including information technology (IT) from Smartforce and NETg.

One reason for the success of these courses is that upper management had implemented a policy that all employees would maintain a personal development portfolio, and demonstrate steps towards their goals. Because the e-learning courses were free and available to everyone, they became very popular. It is always good to have an e-learning initiative tied to other organizational objectives and initiatives. People are often hungry to get training to improve their skills and advance their careers, but they don't always get the opportunity. E-learning made it accessible.

Telus management was interested in developing some of their own proprietary courses, so an extensive review of available course authoring tools was made. Click2Learn ToolBook software was selected for this purpose. The plan was to enable more than 100 people throughout the organization to create courses using this tool, so ease of use was an important criterion. A training program was put into place to train those people. The tool was found to be useful particularly for training on new products and services. Telus typically introduces several new products and services each month, and traditional training approaches were simply too slow to address this. One of the first courses developed was on a new feature for telephones called "Talking Call Waiting". The course was made available to sales and customer service people. In this case e-learning made it possible to distribute training to everyone who needed it much more quickly than could have been done by traditional methods.

Another course on ADSL (asymmetric digital subscriber line high-speed Internet connection) was made available to everyone and had more than 1,000 hits in the first few days.

Up to this point, only very simple management tools had been used to track the results, and a good deal of work was done manually. Telus then did a study of LMSs and decided that they would build their own system because they had an extensive and skilled IT staff that had developed parts of such a system for individual departments.

In 2004, Telus reported that it had developed 300 custom courses for its employees and there were a total of 100,000 course completions for both custom and generic courses. E-learning is now a way of life for Telus.

San Francisco state university case study: an open source solution

by Kevin Kelly, Online Teaching and Learning Coordinator

In Images of Organization, Gareth Morgan (2006) describes double-loop learning, or a process by which organizations go beyond simple behavioural changes to reach goals. They do this by questioning the way they normally do things in an effort to improve. The decision process to move from one learning management system to another might be considered an example of double-loop learning.

San Francisco State University (SFSU) began this process after experiencing some technical difficulties with a commercial LMS. The campus had experienced a number of issues related to an upgrade, including intermittent performance issues and a thirteen-hour outage during finals week. While the vendor worked hard to alleviate the problems, the campus began to discuss the future. Based on feedback from faculty focus groups, the campus decided to investigate alternative LMS solutions.

To begin, academic technology staff members looked at several commercial and open source solutions. During the focus groups, the faculty members provided a simple requirement: "We can't go backward." In other words, any alternative had to have the same capabilities as the existing LMS. After setting up mock courses in more than ten environments, the academic technology team found that Moodle provided the flexibility to meet faculty and student needs quickly, as well as a nearly parallel set of features for online teaching and learning.

After selecting Moodle, the team created the LMS investigation roadmap. At each stoplight on the roadmap, the campus would evaluate the project status. If Moodle was not meeting teaching and learning needs, then the campus would start over with another tool. If faculty and students gave a "green light", then the investigation would continue.

In Fall 2004, SFSU began an alpha test with five instructors and 300 students. One instructor with more than 100 students in the alpha test liked it so much for her large class that she moved several large sections totaling 850 students to Moodle for the beta test. In Spring 2005, the campus ran a beta test with 25 instructors and 1,500 students. The academic technology team performed extensive outreach to get faculty in all nine colleges to participate in order to evaluate the needs of different disciplines. An Associate Vice President requested scalability tests in Fall 2005 and Spring 2006 with over 100 instructors and 6,000+ students and 9,000+ students respectively. At each stage, the campus used the roadmap test to verify that it was on the right track.

At the same time, the Academic Technology team worked with the Disability Programs and Resource Center to conduct accessibility testing. This involved more than running a web-based verification program. To make sure that the accessibility testing would address real needs, the campus asked students with disabilities to help test the LMS with assistive technology such as JAWS, a screen reader application, and Dragon Naturally Speaking, a voice recognition program. Similarly, the Academic Technology team worked with an SF State faculty member and a UC Berkeley graduate student in a usability related course to facilitate usability testing with Moodle.

The faculty-run Educational Technology Advisory Committee worked with the team throughout the process and, at the end, made a recommendation to move exclusively to Moodle as the online teaching and learning environment. The recommendations included a list of items for the campus academic technology unit to address, such as improving the grade book and creating a list of frequently

asked questions for support. Based on this recommendation, the Provost announced that the campus would use Moodle exclusively when the vendor contract expires in Summer 2007.

While the original drivers were technological, the campus also received equivalent pedagogical and administrative benefits. Instructors have been changing the way they teach, and writing articles about the scholarship of teaching and learning. As Moodle is open source software, the campus has created a consortium of regional two-year and four-year colleges and universities to create economies of scale related to software development, training and support, and other forms of collaboration. More is yet to come.

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CHAPTER OVERVIEW

15: Module 15- Future Trends in Educational Technology

15.1: Emerging Trends in The Use of Emerging Technologies in E-learning
15.2: Benefits of Using Emerging Technologies in E-learning

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15.1: Emerging Trends in The Use of Emerging Technologies in E-learning

Educators need to develop innovative models of teaching and delivery methods tailored to emerging technologies. Future learning systems should contain intelligent agents to duplicate one-to-one tutoring. Multiple intelligent agents could also monitor learners' progress, and cater to individual needs and styles. Intelligent learning systems will allow learners to be more active and will place more responsibility on them in the learning process. Research is needed on how to empower learners to learn on their own and how to activate learners' metacognitive skills.

Content will be designed as small chunks in the form of information and learning objects. This will allow intelligent agents to prescribe the most appropriate materials based on learner's learning style, progress, and needs. The intelligent agents will assemble these chunks into a larger instructional sequence so that learners can achieve the learning outcomes of the lesson. More work is needed on how to develop learning objects and how to tag them for easy retrieval by intelligent agents.

Future technologies will use intelligent agents to assemble courses and modules of instruction immediately by accessing learning objects from repositories. Because of the changing nature of content, models are needed to develop learning materials in as short time as possible using techniques similar to rapid application development (Lohr et al., 2003). Smart learning systems in emerging technologies will be able to assemble unique courses for each learner, based on the learner's prior knowledge, learning preferences, and needs.

Pervasive computing is making it possible for computing power to be included everywhere, thanks to tiny microprocessors and wireless access. As a result, educators must design for pervasive computing where learners will access learning materials using everyday objects and environments. For example, learners might be able to access course materials using kitchen appliances, or their clothing.

The trend in hardware development is towards virtual devices, such as the virtual keyboard and virtual screen. With these devices, learners are able to turn on the device, use it, and then turn it off. For example, for input into a computer, a learner can press a button to turn on a virtual keyboard on a temporary surface, use it, then turn it off. When developing learning materials for emerging technologies, educators must design for delivery on these virtual devices.

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15.2: Benefits of Using Emerging Technologies in E-learning

Because of the rapid development of information technology, there is a shift from print-based learning to elearning to mobile learning (m-learning). M-learning refers to the use of electronic learning materials with built-in learning strategies for delivery on mobile computing devices (Ally, 2004a). Mobile devices offer many benefits. Thanks to wireless technology, mobile devices do not have to be physically connected to networks to access information. They are small enough to be portable, allowing users to take the devices anywhere. Users can interact with each other to share information and expertise, complete a task, or work collaboratively on a project.

Benefits of emerging technologies for education:

- Education is scaleable, since educational institutions do not have to build classrooms and infrastructure to hold face-to-face classes. To accommodate more learners, educational institutions need only expand the network and hire more instructors to facilitate additional courses.
- Electronic learning materials are easy to update. Because learners use their mobile devices to access the learning materials from a central server, they can receive these updates as soon as they are made.
- The same learning materials can be accessed by students from different regions and countries.
- Learners can complete their education from any location as long as they have access to the learning materials, possibly through a wireless connection.
- Because learners can access the learning materials anytime, they can select the time they learn best to complete their coursework. This increases the success rate in learning, and facilitates informal learning.
- Designers of learning materials for emerging technologies can leverage the computing power of the technology to personalize the learning experience for individual learners.
- Since learning with emerging technologies is learner-focused, learners will be more involved with their learning, and thus motivated to achieve higher level learning.
- For businesses, mobile learning can be integrated into everyday work processes, which promotes immediate application. The emerging technologies allow workers to access learning materials for just-in-time training.
- Because most learners already have mobile technology, educational institutions can design and deliver courses for different types of mobile technology (Ally & Lin, 2005).

Mobile technologies such as Blackberries, Treos, iPods, and cell phones are being used in the classroom and in distance education to reach out to students and to deliver learning materials to students. Instructors are taping their lectures and making them available for students to listen whenever they like. Providing lectures and learning materials in audio format is important for some subject areas such as when learning a language and English Literature. The mobile technologies are also used to connect to students to inform them when course requirements are due and informing them on updates to courses. Mobile learning technologies can be used in any discipline that can be broken down into small segments of instruction. This will allow students to complete one segment at a time. In addition to playing a support role in classroom instruction, mobile technologies can play a major role in distance education by delivering instruction anywhere and at anytime. Books and course information will have to be formatted for reading on computer and mobile devices screens. A good example of how this is being realized is the screen on the one hundred dollar laptop (OLPC, 2006). Information on the screen can be read in daylight as well in the dark. The small screens on the mobile devices are becoming more advanced for reading. As with the development of the virtual screen, students will be able to project information and images on a surface that is the same size as a regular computer screen.

However, before these benefits can be realized, the learning materials must be designed specifically for emerging technologies.

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