LEARNING OBJECTIVES

After completing this module, you should be able to

- Define sociocultural learning theory and describe one example of engaged learning.
- Compare and contrast constructivist, constructionist, and behaviourist theories of learning.
- Define critical literacy and describe one activity where you could apply this to the classroom using digital technologies.
- Define each of the 4 Cs (communication, collaboration, critical thinking, and creativity) and give examples to show how these are embedded in twenty-first-century learning practices.
- Identify and describe the four support systems that comprise the framework for twenty-first-century learning.
- Explain four learning outcomes for twenty-first-century learning and give one student learning example for each.
• Distinguish between Web 1.0 and Web 2.0 technologies, and describe one example of how a particular Web 2.0 technology can be used in the classroom.
• Explain what is meant by technological pedagogical and content knowledge.
• Describe three ways teachers can use digital technologies in the classroom to enhance students’ learning.

PART 1: THEORY

Particular theoretical or conceptual frameworks usually support curriculum and pedagogy, whether or not these theories are explicitly stated or acknowledged. In Part 1 of the module, we will discuss a few grand or overarching theories that might assist you in thinking about how you will integrate digital technologies for effective teaching and learning. The discussion is presented in the following subsections:

- Theories of Engaged Learning
- Twenty-First-Century Learning Theory
- Web 2.0 and Multiliteracies Theories
- TPACK Theory

Following our introduction to each theory, we have provided suggestions of websites for you to explore and readings that will enable you to extend your learning about the topic.

THEORIES OF ENGAGED LEARNING

The phrase “engaged learning” describes active decision making and participation by learners in the learning process. This opening section of Part 1 will provide several explanations of engaged learning, emphasizing sociocultural, constructivist, constructionist, and critical theories and their intersections with other theories. As a contrast, we will also discuss behaviourist learning theory to provide you with information needed to make judgments about the underlying assumptions embedded in student learning activities. We will conclude the section by discussing brain-based learning theories, multiple intelligences, and differentiated instruction within an inclusive educational context.

SOCIOCULTURAL THEORY

Sociocultural theory offers an overarching understanding of human behaviour, and, in particular, the interdependence of individuals and society (John-Steiner & Mahn, 1996). It connects well with currently accepted educational learning approaches, such as constructivist, constructionist, and critical theories, and supports thinking about how digital technologies might be used for teaching and learning. Sociocultural theory acknowledges that individuals interact with others, within social and cultural structures and processes such as families, clubs, institutions, communities, and societies. Cultures and societies are dynamic and ever-changing, influenced by globalization, international relations, politics, business, and mass media. At the local level, as we live our daily lives and take part in social and cultural events, we are participating in discourses and practices associated with those events, within the larger societal and cultural contexts (Warschauer, 1997). For example, the practices of acting and interacting during a family gathering are different from the ways in which we participate in a formal business dinner. Central to our participation with others are all
forms of communication, including language and meaning-making signs, which are both mental (organizing and understanding phenomena) and social (communicating understandings to others). The study of signs is “semiotics,” a science closely connected to media, advertising, internet, literacy, linguistics, and all aspects of education.

Sociocultural theory recognizes that language and other semiotic tools and symbols are central to learning. From birth, through both formal and informal learning, we discover language, literacy practices, and other activities central to the various communities and discourses in which we participate. James Gee (1990) is one theorist who has explained discourses (he capitalizes the word to distinguish it from its reference to language in use) as social practices of a like group—language style and vocabulary, perspectives and ways of thinking, customs and conventions, texts, and even the group’s clothing and food choices. We are acculturated through multiple discourses and communities—both formal (e.g., a religious group) and informal (e.g., fans of hip hop or a particular celebrity). Readers of a particular author or members of a profession participate in the discourse of that group. Skateboarding may be seen as a discourse; think about the activities, style of dress and appearance, language, and media preferences that you would gradually acquire as you became a member of that group. There are also similar discourses operating within online communities, as Constance Steinkuehler (2006) demonstrates in her research. As well, schools have particular discourses with specific ways of being for teachers and students as they participate in various schooling events.

CONSTRUCTIVIST THEORY

The claim of constructivist learning theory is that we best acquire and understand knowledge that we have constructed ourselves through engaged interaction with information. Vygotsky, one constructivist learning theorist, emphasized social meaning making and constructing knowledge through experience (exploring, doing, reflecting, and problem solving) in collaboration with other learners. Vygotsky (1978) suggested that through collaboration, negotiation, and guided practice, as learners we acquire the knowledge and ways of thinking, acting, and being within various discourse communities inside and outside of school. Within schools, for example, we are introduced to the practices and literacies of scientists, geographers, mathematicians, artists, historians, and democratic citizens. On the internet, we may join with gamers and fans of celebrities or authors in their discourse communities, learning the vocabulary, tools, and activities of community members.

Vygotsky’s zone of proximal development, another aspect of constructivist theory, is also relevant in both formal (school) and informal (community) settings. Teachers arrange groups so that students more knowledgeable about a topic or task can assist those ready to learn. For example, in Grade 9, as groups of students work on creating digital responses to Romeo and Juliet, some students emerge as group leaders because of their technological knowledge and skill, while others in the group may lead in knowledge and understanding of the play. Similarly, in less formal settings such as skateboarding groups, older skateboarders demonstrate new moves to learners. In the same way, online gamers seek advice from aficionados on social networking sites. This concept involves scaffolding learning experiences and guided practice in order to support and advance further learning.

Jean Piaget, like Vygotsky, advocated constructivist learning theory, though his conception differed slightly, and his theory of learning is often identified as cognitivist. Piaget believed we use schemes or organizational frames to make sense of ideas and experiences. New ideas and experiences that do not fit our schemes cause mental disequilibrium; so, when exposed to something different, we must use processes of assimilation (fitting it into our existing schemes) or accommodation (changing our existing schemes or creating new ones to make sense of it). These processes restore equilibrium in our
Thinking. In the classroom, problem solving, inquiry, and concrete experiences (field trips, drama, building and using objects, and other hands-on activities) engage students in this Piagetian sense of learning.

In constructivism, discipline knowledge, and particularly languages and literacy skills, are best learned through engaging in authentic, situated learning contexts rather than in isolation. Lave and Wenger (1991) advocated situated learning in a community of practice; in this approach, learning takes place within the same context as it is applied, through observing and doing with more knowledgeable practitioners. Knowledge is thus not decontextualized and abstract, but rather collaboratively constructed within particular social and physical contexts, with the appropriate tools, equipment, or instruments. Schools attempt to reconstruct real-life settings using labs, workshops, stages, band rooms, gymnasia, and other special learning spaces. In classrooms, teachers introduce problem-based learning, and students explore authentic texts and resources to find solutions.

Computer technologies also offer situated learning opportunities—for example, alternative reality games such as SimCity and Second Life or other video environments that have authentic social contexts, such as social networking sites. Gee (2005) argues that video games are built on solid learning principles (which he articulates with examples) and that we can learn through gaming. He notes, “Game designers can make worlds where people can have meaningful new experiences, experiences that their places in life would never allow them to have or even experiences no human being has ever had before. These experiences have the potential to make people smarter and more thoughtful” (p. 6).

Blogs can provide similar real-life contexts for sharing research and stories. Social networking sites can be set up as communities of practice in which learners interact, explore, negotiate, and co-create.

CONSTRUCTIONIST THEORY

Constructionism is defined by its originator, Seymour Papert (1991) as “learning by making” (p. 1). Educators have used the terms “constructivism” and “constructionism” interchangeably to describe learning theories that evolve from the works of Piaget (1973), Vygotsky (1978), Lave and Wenger (1991), and Papert (1991), in which learners engage as constructors and producers of their own personal representations of knowledge and learning. These theories are distinguished from what Papert calls “instructivism,” in which the teacher passes information to passive learners. Papert (1991) explains the difference between constructivism (building knowledge) and constructionism (building and representing knowledge externally). We suggest that multimodal composing—used in activities such as making digital movies—is a constructionist activity: students represent understandings that are often constructed collaboratively in social, constructivist learning contexts, using digital technologies to do so.

Digital and online Web 2.0 technologies (described below as the interactive, participatory web) can support constructivist and constructionist learning practices. It all depends on the pedagogy—how the technologies are used. Take YouTube as an example. A teacher can show students a video (e.g., a TED (Technology, Education and Design) Talk, The Story of Stuff, or a video about whatever students are studying). This is instructivist pedagogy. If students have a conversation about the video, particularly in groups in which they respond to questions about it, this is a use of constructivist pedagogy. Teachers and students can also use YouTube’s comment tool to add thoughts to the ongoing conversation about the video. If students go on to make an iMovie or photo story in response to the video and post it on YouTube, this also uses a constructionist approach. If similar keywords or tags are used, the response videos will probably display on the same page as the original.
BEHAVIOURIST THEORY

Behaviourism preceded the engaged learning theories as an influence on education and pedagogy. In contrast to constructivist theories, behaviourism accepted rote memorization of facts presented by a text or teacher as the model of learning. Instructivism, discussed above, fits within behaviourist theory. Most early educational software—drill and practice and programmed instruction software—was created to implement this type of learning. The computer screen presents a question, the learner selects an answer, and the learner is immediately rewarded or corrected, depending on the answer. More practice can be provided by the program if the learner makes a predetermined number of errors while completing the set of tasks. This sort of educational software still exists in schools, sometimes as game-like activities on computers, personal learning devices, or interactive whiteboards (IWBs). For example, some of the more popular IWBs, such as Jeopardy, involve students in responding to questions and do not require them to create or collaborate in any way. Others are simply worksheets that have been put on a screen, and students have to fill in the blanks or answer multiple choice questions using clickers. This is not to say that such activities are not useful; sometimes rote learning of information, such as basic arithmetic facts, is important, and computer programs can provide just-in-time practice to individuals and small groups and relieve teachers from time-consuming and ineffective whole-class instruction.

Another behaviourism-related software that is still used is integrated learning systems (ILS) software, which monitors individual student progress on a set of learning tasks. One such ILS in a local school presents a quiz on a novel that a child has just completed reading. The reading list is predetermined within the system, as are the quizzes and correct answers. The software program provides the teacher with data such as the number of books read and the quiz scores of each child in the class. Web 2.0, the participatory web discussed in detail in the next section, provides interactive learning sites that may fulfill similar functions as ILS. We recently explored the Children’s University of Manchester site, an intriguing site about Egyptology (www.childrensuniversity.manchester.ac.uk/interactives/history/egypt). The site provides lots of information, images, learning games, and quizzes about ancient Egypt; it also has connections to current UK curricula and options for tracking progress through the National Children’s University’s “Passport to Learning.” Like most learning within the behaviourist tradition, the website presents information that children acquire individually through memorization, repetition, reinforcement, and reward—in this case, through immediate feedback such as “Yes, that’s right!” after each answer.

Maddux, Johnson, and Willis (1992) provide a valuable analysis of what they call Type I and Type II educational computing applications. They describe Type I applications as having

- somewhat passive involvement by the learner (who does not create or compose),
- screen events predetermined by the software developer,
- a limited repertoire of accepted responses by the user,
- acquisition of facts by rote learning, and
- relatively short periods of involvement. (pp. 20–21)

Type II applications, on the other hand, support higher order thinking skills such as critical thinking and problem solving. These applications include word processing, spreadsheets, database software, simulations, and a variety of assistive technologies. Such software is either installed on computers, or, more recently, used online as Web 2.0 technologies. The common characteristics of Type II applications include

- active intellectual participation,
- user control of screen events,
- an extensive repertoire of acceptable user contribution,
creative possibilities, and
generally longer learning and use involvement (Maddux, Johnson, & Willis, 1997, p. 22).

These researchers remind us of the place of all types of applications in schools, and of the relevance and usefulness of all learning theories. At the same time, they argue that we as educators do, and should, place greater value on Type II applications and more constructivist learning theories.

CRITICAL THEORY

Critical theory, another theory of engaged learning, is a theory employing critique. It had its roots in prewar Europe with the Frankfurt School of intellectuals who sought to critique knowledge, ideology, capitalism, and mass culture, particularly as they were realized in social movements such as anti-Semitism. Critical theorists also sought to understand in new ways the underpinnings of society, economics, politics, art, ethics, and psychology. The founding philosophers of the Frankfurt School, and their second- and third-generation followers, have been influential in many fields of knowledge, including education. We will concentrate our discussion on Paulo Freire, whose vision was social change through education.

Freire (1970/1992) introduced the now famous “banking concept of education” (pp. 58–60) and its preferred alternative “consciousness” (conscientization) and “liberating education” (pp. 66–67), consisting of dialogical relations, praxis, and problem-posing education. Freire’s ideas about reading and writing the word and the world have been implemented in education as critical literacy (Freire & Macedo, 1997; Shor, 1992), which refers to reading texts (linguistic and multimodal) beyond their surface or literal meanings to discover what viewpoints and perspectives are not represented; to oppose, resist, and challenge values and beliefs put forward by authors and characters; to focus on situations and issues related to lack of fairness, social justice, and equity in texts and around them; to question where power lies, who has it and who does not; and to analyze and contest accepted norms and dominant and conventional encodings of power. It also refers to rewriting and remixing texts, to intervening and reinterpreting texts and their messages. Engaging in critical literacy means becoming “conscientized,” looking critically at inequities in one’s own life and experience, and taking action for social change.

A good example of critical literacy that has been in the news recently is the story of Malala Yousafzai, the young Pakistani girl who was shot for blogging about the lack of educational opportunities for girls in her country. She was writing the word and the world. A response to her story, by a Canadian woman, Cheryl Braganza (2012), was published in the Montreal Gazette. Braganza also created an art piece and posted it on her blog at www.cherylbraganza.com. Asking all of us to try to help Malala spread her message, Braganza wrote, “She had been blogging quietly since the age of 11, after Taliban militants burned girls’ schools in the area. She was trying to explain the importance of education to anyone who would listen.” Malala, age 14, was shot by the Taliban, but recovered with medical attention in England, having captivated the world in her cause. It seems she may accomplish the social justice change she desired. What is interesting is that these two women, both powerful bloggers, wrote their world and, in the process, are changing it. This is the power of critical literacy and Web 2.0.

PSYCHOLOGICAL LEARNING THEORIES

Many educational systems have policies and curricula that support inclusion of all students and are often informed by the philosophy and principles of social justice. The inclusive education movement that aspires to institute equitable learning opportunities for all students has gained momentum in the past few years (Ayers, Quinn, & Stovall, 2008; Curcic,
There is an assumption that students are all unique and learn in different ways depending on their cultural backgrounds, learning preferences, interests, talents, strengths, and so on. At its core, inclusion means that all students, whenever possible, are included in classrooms with their same-age peers. Inclusive educational practices require appropriate learning supports for students and that teachers have knowledge about how to program for each student by differentiating instruction, providing choice, designing open-ended learning tasks, adapting and modifying instructional practices, and making use of assistive and other technologies that enable learning and the representation of knowledge in multimodal ways. For example, one child may be able to represent her understandings by writing them down on paper, while another child may need to present the information orally and another may need to use visual applications on his iPad. There is thus an understanding that individuals can learn and represent their knowing in different ways.

Howard Gardner’s (1983) theory of multiple intelligences has been advocated in support of inclusive practices and as a way to differentiate instruction. Multiple intelligence theory proposes that teachers find out about and make use of students’ learning styles by assessing their multiple intelligences. Gardner (1983) explains that every learner has a unique “intelligence profile” and that teachers should “individualize” and “pluralize” instruction by presenting concepts in a variety of ways and modes of delivery (p. xvi), as well as by encouraging students to “create products” (p. xxviii) that demonstrate their intelligences. Gardner also advocates “intelligence-fair” (p. xxxiv) assessment.

Gardner’s intelligences include

- **linguistic**, which pertains to effective use of words and facility in acquiring additional languages;
- **logical-mathematical**, which involves the effective use of numbers and “sensitivity to logical patterns and relationships”;
- **spatial**, which is the “ability to perceive the visual-spatial world accurately ... [and] sensitivity to color, line, shape, form [and] space”;
- **bodily-kinesthetic**, which refers to “expertise in using one’s whole body to express ideas”;
- **musical**, which relates to the “capacity to perceive, ... discriminate, transform, ... and express musical forms”;
- **personal**, including both inter-personal (understanding others) and intra-personal (self-understanding); and
- **naturalist**, which pertains to expertise in and sensitivity to the environment.

(Armstrong, 2009, pp. 6–7)

We include Gardner’s theory and differentiated instruction theory in this module because, in addition to the assistive technologies that support exceptionalities, many educational technologies support learning and enhance teaching in inclusive classrooms. Digital and Web 2.0 technologies can be used to support the presentation of information (e.g., text readers, ebooks, YouTube, multimodal and interactive websites), to facilitate collaborative knowledge construction (e.g., wikis and social networking sites), and represent learning (e.g., blogs, glogs, and digital movie-making software). We continue our discussion of these technologies and their affordances in our section on Web 2.0 and multiliteracies, in which we note the overlap between multiliteracies and multiple intelligences.

**ASSESSMENT FOR ENGAGED LEARNING**

The theories of engaged learning emphasize understanding over rote memorization, deep learning rather than surface attention, complexity instead of unnecessary simplification, process as opposed to product, and critical thinking and creativity rather than compliance with formulaic...
routines. Such changes necessitate new forms of assessment that are commonly described in education as assessment for, as, and of learning, as detailed in the Learning for All document (see www.edu.gov.on.ca/eng/general/elemsec/speced/learningforall2011.pdf). These three types of assessment practices are used for different purposes and generate different kinds of data. Assessment for learning is formative and refers to the ongoing everyday assessments that teachers use to inform instruction and plan for students’ learning. Assessment as learning involves developing students’ metacognition in order for students to actively engage in the learning process. Students learn how to establish learning criteria, set learning goals, make use of descriptive feedback, and engage in self-assessment. Assessment of learning is summative and used to find out what a student knows and is able to do at the end of learning. This type of assessment can take the form of end-of-term portfolios, culminating assignments, unit projects, inquiry based reports, and/or unit tests. Assessment of learning is used to determine the degree to which students have achieved the learning outcomes at a particular point in time.

Authentic assessment requires students to demonstrate what they can do, applying acquired knowledge in real-world situations that are similar to the learning contexts they have experienced. Critical thinking and creativity, two of the 4Cs skills that also include collaboration and communication (discussed in more detail in the Twenty-First-Century Learning section below), require students to reason effectively, use systems thinking, make judgments and decisions, and solve problems, as well as to originate, brainstorm, elaborate, develop, implement, and innovate (National Education Association, n.d.). Assessment, whether summative or formative, should also necessitate the demonstration of such abilities.

The theories of engaged learning we have discussed follow a sociocultural model and involve social interaction and collaborative learning. Assessment practices should therefore include opportunities for reflection on and feedback about students’ learning process, including participation in collaborative activities.

Rubrics, which may be used for summative assessment, are also useful in facilitating strategies for formative assessment. Teachers and students can design rubrics together or discuss and modify existing rubrics to encourage metacognitive understanding and ensure that the rubrics fit the current context and purposes and align with curriculum outcomes. Rubrics may centre on process as well as product; in this sense they may provide guidance in reflection on collaboration and communication, the other components of the 4Cs of twenty-first-century learning.

Rubrics may be holistic or analytic. Holistic rubrics provide descriptions to support overall impression judgments of composition or performance. As the Center for Advanced Research on Language Acquisition (CARLA) notes, holistic rubrics have both advantages and disadvantages.

Advantages:

- They are often written generically and can be used with many tasks.
- They emphasize what learners can do, rather than what they cannot do.
- They save time by minimizing the number of decisions raters must make.
- Trained raters tend to apply them consistently, resulting in more reliable measurement.
- They are usually less detailed than analytic rubrics and may be more easily understood by younger learners.

Disadvantages:

- They do not provide specific feedback to test takers about the strengths and weaknesses of their performance.
- Performances may meet criteria in two or more categories, making it difficult to select the one best description. (If this occurs frequently, the rubric may be poorly written.)
- Criteria cannot be differentially weighted. (CARLA, 2009a, n.p.)

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