



Implementing Connectivist Teaching Strategies in Traditional K-12 Classrooms

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Abstract. Connectivism is a learning theory that is designed for the digital age. Students in today's classrooms are digital natives who have unique learning styles. Connectivism has been studied primarily in online college classes and has been shown to increase motivation and student achievement. However, connectivism has not been widely explored in traditional K-12 classroom settings. Implementing connectivist learning strategies in traditional K-12 classrooms can bridge the gap between the needs of digital natives and K-12 education. The purpose of this paper is to present practical strategies for implementing connectivist learning strategies in the traditional K-12 classroom. Five strategies for implementing connectivism in the traditional K-12 classrooms are (1) shifting from teacher-centered to student-centered pedagogy, (2) incorporating technology with readily-available devices, (3) never providing information that students can access themselves, (4) incorporate and practice utilizing technology networks, and (5) incorporate and practice utilizing social networks.

Keywords: Connectivism · Connectivist learning · K-12
Traditional classroom · Technology integration · Social networks
Technology networks

1 Introduction

Technological advances have changed just about every aspect of modern society. However, education is one of the slowest areas to adapt to the change (Hung 2014). Connectivist learning strategies have been shown to be effective in online classroom settings at the tertiary level. In K-12 education, the standard in North American education remains based in traditional practices that focus on presenting academic information in print and text and do not allow students to interact with the material (Hicks and Sinkinson 2015). K-12 classrooms are knowledge-centric and view education as an individual achievement (Barsness and Kim 2015). Most current classrooms promote individual performance and learning (Saritas 2015). Unfortunately, students in the current K-12 classrooms are different from those of previous generations. Today's students learn best when they can network with one another and work in teams, so there is a disconnect between traditional classroom pedagogy and student needs.

'Digital natives' is a term that was coined in 2001 to describe students who were born and have grown up immersed in the current technological world (Prensky 2001).

Current K-12 students are considered digital natives. Education needs new pedagogies that can adapt to changing technology, increase active learning, and provide authentic learning opportunities for digital natives (Hicks and Sinkinson 2015). Students today have constant access to information and have different learning styles that can be leveraged through an understanding of connectivism to help students be more successful. Digital natives have unique learning styles, communication styles, and are adept at multi-tasking and working in teams (Saritas 2015). Trnova and Trna (2015) stated that digital natives prefer to work in teams, learn through inquiry, and prefer to learn by doing rather than listening. Therefore, there needs to be a pedagogical change to learner participation instead of information retention (Downes 2010). Connectivism explains learning in the digital age, and views learning as the process of transforming information into meaning (Siemens and Training 2005). Implementing connectivist learning strategies in traditional K-12 classrooms will help to close the gap between student needs and classroom teaching. The purpose of this paper is to present practical strategies for implementing connectivist learning strategies in the traditional K-12 classroom.

2 Connectivism

Connectivism was developed to understand learning in the digital age. Siemens (2005) stated that the time to revise existing theories has passed, and a new theory to address the technological world is needed. The theories of behaviorism, cognitivism, and constructivism are no longer sufficient to address the type of learning that occurs in classrooms that are greatly impacted by technology (Siemens 2005). Connectivism is based on the idea that the world is changing rapidly, and new information is constantly being acquired. People need to be able to distinguish important and unimportant information. Connectivism acknowledges that knowledge can reside in non-human entities (Siemens 2005), like computers and technology networks. The individual is still the learning point, but knowledge entails a network. Knowledge, in connectivism, is not passive; knowledge is the transformation of information into meaning (Siemens and Training 2005). Connectivism is characterized by eight principles of learning. The eight principles of connectivism, developed by Siemens (2005) are:

1. "Learning and knowledge rests in diversity of opinions.
2. Learning is a process of connecting specialized nodes or information sources.
3. Learning may reside in non-human appliances.
4. Capacity to know more is more critical than what is currently known.
5. Nurturing and maintaining connections is needed to facilitate continual learning.
6. Ability to see connections between fields, ideas, and concepts is a core skill.
7. Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
8. Decision-making is itself a learning process" (p. 4).

Connectivism views learning as a result of network connections. According to AlDahdouh et al. (2015), connectivism recognizes three types of networks: neural, conceptual, and external. Neural networks are connections of a neuron's axons and

dendrites. The conceptual level consists of connections of concepts, ideas, and thoughts. The external networks involve people and technology (AlDahdouh et al. 2015). The external networks are social networks or technology networks that can be implemented in classrooms. Learning occurs through connections within these networks.

Schools no longer need brick and mortar buildings to provide quality education. With computer technology, knowledge can be acquired from non-human entities and networks (Siemens 2005). Computer and internet technology have changed higher education; classes have evolved from brick and mortar institutions with traditional teaching to online and distance learning classes. Implementing connectivist strategies in online college environments has helped increase student motivation, engagement, and achievement (Trnova and Trna 2015). In addition, college students report that learning in a connectivist environment allows them the freedom to learn through their preferred learning style which increases their achievement (Trnova and Trna 2015). The implementation of connectivist learning strategies lessens the gap between student learning needs and classroom pedagogy.

Unfortunately, connectivism has not entered the conversation in traditional classroom settings, likely because it is assumed that they are incompatible. Connectivism is a theory that explains how people acquire knowledge; therefore, connectivist networks should be present in all classroom environments. But, connectivism has not been discussed in relation to traditional K-12 education. One of the major tenets of connectivism is that learning occurs through networks, both using technology and face-to-face interaction with peers. Therefore, connectivist strategies are applicable to all classroom environments that are conducive to networks, including traditional classroom settings.

Most K-12 settings are still in traditional school settings with teacher-centered classrooms. So, little research and literature has been dedicated to connectivism in K-12 education. Connectivist classrooms in a K-12 setting will not look like online college classrooms that have traditionally been associated with connectivism. The strategies that are successful in online tertiary classrooms are not suitable for traditional K-12 classrooms with one teacher in the classroom with a group of students. However, that does not mean that connectivism cannot be successfully implemented into K-12 classrooms to meet the needs of digital natives.

3 Connectivist Strategies for Networked Learning

There are four strategies for learning in connectivist networked environments. The four strategies can be implemented in any classroom environment, including traditional classrooms. Four learning strategies utilized in connectivist environments are learner autonomy, resource openness, network connectivity, and opinion diversity (Smidt et al. 2017) which may be present in any classroom environment. Connectivist strategies can and should be implemented into all classrooms, including traditional K-12 classrooms.

Learner Autonomy. Students should be given choice regarding their learning resources and assignments. Students should be independent learners who set their own goals and outcomes. Learners become autonomous when they are given control over

their learning (Smidt et al. 2017). Student choice can be increased through networking in the classroom.

Resource Openness. Students should have the opportunity to communicate in networks to gain and share knowledge (Smidt et al. 2017). Using networks allows students to access a variety of technological and social resources that were not previously available in classrooms.

Network Connectivity. Students should be encouraged to make connections with technological and social networks (Smidt et al. 2017). Students gain knowledge from their classmates, teachers, and online resources.

Opinion Diversity. Students should be given the opportunity to use their networks to gain different opinions and perspectives on various topics (Smidt et al. 2017). Connecting with other students promotes problem solving and social skills.

4 Strategies for Implementing Connectivism in Traditional K-12 Classrooms

When connectivism is successfully implemented into the traditional classroom, students benefit from learning through networks. The networks allow students to access, assimilate, and acquire knowledge. This paper presents five practical strategies that teachers in traditional K-12 classrooms can implement to incorporate the connectivist learning strategies of learner autonomy, resource openness, network connectivity, and opinion diversity.

4.1 Shift from Teacher-Centered to Student-Centered Pedagogy

Most K-12 classrooms are still following the traditional teacher-centered model of instruction. But the current generation of digital natives require a change in pedagogy to meet their unique needs as learners. Technology has changed the way that students think and learn, which has led to the need for a new approach to teaching and learning (Siemens 2005). Barsness and Kim (2015) asserted that the current Eurocentric model of pedagogy has limits and conflicts with current culture as it is knowledge-centric and views education as an achievement. Educators must rethink their current practices and pedagogies to prepare students for the real world (Barsness and Kim 2015). According to Bair and Stafford (2016), the instructor in the classroom should become the facilitator of the community of learners. Learning needs to be in the control of the learner, but the facilitator plays the important role of helping to guide the learning community and focus of the learners (Bair and Stafford 2016). To prepare students to be productive and successful in the 21st century, connectivism should be applied as a pedagogical approach that recognizes networks as tools for the distribution of knowledge, even in the traditional classroom model.

Full implementation of connectivism in the classroom shifts the pedagogy of the classroom away from the traditional classroom model and toward a more student-centered model. According to Hung (2014), the implementation of connectivist

teaching will transform the traditional classroom. Connectivist learning networks place the responsibility for learning on the learner, increasing learner autonomy. Connectivist environments shift the control of learning away from the instructor and onto the learner (Siemens 2005). Learning occurs when students form connections that allow them to create their own learning (Siemens 2005). Conradie (2014) stated that connectivist learning allows students to create connections and develop networks, which promotes learner autonomy. The student should be the focus of the classroom in a connectivist environment rather than the teacher.

Connectivism promotes active learner engagement that increases student autonomy. Connectivist classrooms teach students to be autonomous learners by incorporating student choice and networking in the classroom. Students become more engaged in the learning process, and students who are engaged in the classroom are 75% more likely to have higher grades (Shan et al. 2014). Gillard et al. (2015) completed a study of undergraduate college students and found that autonomous students felt free to think for themselves, giving them the desire to learn for themselves. Autonomous students had a desire to master the task and provide their best work. Students who felt they were given autonomy, mastery, and purpose, become more intrinsically motivated to succeed. Shifting classroom pedagogy toward student-centered teaching focuses the learning environment on the needs of digital natives.

Beginning the process of shifting from a teacher-centered environment to a student-centered environment can be supported with technology. Incorporating software that enhances the student's control and freedom also increases student autonomy. Teachers should use a platform that allows students to access their assignments, manage their due dates, and communicate with the instructor. Several programs are available to K-12 instructors free of charge and can easily be implemented to increase learner control and autonomy.

4.2 Incorporate Technology with Readily-Available Devices

Successful implementation of technology can change the teaching and learning opportunities in the classroom. Traditionally, content was bounded by what was in the textbook, but the use of technology expands the content and curricula available to students (Hung 2014). Implementing technology has the effect of changing the teacher's practices from a teacher-centered environment to a more student-centered environment (Tondeur et al. 2016). When technology is fully integrated into instructional strategies, students are more satisfied in the classroom and believe that their academic performance is improved (Devasagayam et al. 2013). But, many teachers point to the lack of resources as a roadblock to technology integration because they do not have computers in their classrooms. Connectivist classrooms incorporate technology, but it does not require a class set of computers. Spring et al. (2016) stated that student smartphones are useful for integrating technology in the classroom, even without a class set of computers.

Most K-12 students have smartphones that can be utilized to implement technology in the classroom. Connectivist classrooms allow students to access and assimilate information from technology networks which can be done using smartphones, tablets, or computers. If this technology is not available in the classroom, teachers can request

that parents, teachers, or community members donate their old cell phones that they are no longer using. These devices can easily be connected to the school Wi-Fi and used to meet the technology needs of the students.

Incorporating readily-available devices provides a link between the students' everyday experiences and their education. Allowing students to access technology through their personal devices increases resource openness, one of the strategies for connectivist learning. Incorporating technology that the students are familiar with will increase their comfort level and efficiency of use. Instead of struggling to learn foreign technology, students can focus on increasing their network sharing.

4.3 Never Provide Information that Students Can Access Themselves

A connectivist classroom has an instructor that facilitates the autonomous learning of students by providing expertise and guidance, but not directly providing information. The teacher directs the students to useful resources and poses questions to help organize and guide their research. Siemens and Training (2005) asserted that education should focus less on presenting information and more on building the learner's ability to navigate through the information. The ability to access information to acquire knowledge is more important than the retention of knowledge (Siemens 2005). Connectivist teachers no longer provide pre-determined knowledge, but instead provide a learning idea and guide students to use multi-media, diverse thinking, and networks to access and acquire knowledge (Foroughi 2015). The role of the instructor becomes that of a coach to help students learn how to work in a self-regulated environment (Conradie 2014). With the vast amount of knowledge available, people cannot acquire all of it. Students must learn how to assimilate information in a classroom environment.

A key component of interface design is to increase recognition, so the user minimizes their need for recall. Connectivist learning encourages knowledge acquisition, not memorization. Teachers should introduce students to programs that assist them in quickly and efficiently acquiring knowledge from valid sources. Learning to filter through information to acquire knowledge further increases learner autonomy.

4.4 Incorporate and Practice Utilizing Technology Networks

Accessing content through an online system is not the same as learning within a technology network. Utilizing technology networks is not the same thing as using a search engine to find knowledge. Technology networks involve websites, blogs, and connecting with people through technology. Using technology networks in the classroom empowers students to be autonomous learners. If students need information or clarification, they can access technology networks instead of asking the teacher. However, students do not automatically know how to interact with technology for educational purposes, so they require educational coaching from their teachers.

Dabbagh and Fake (2017) reported that most incoming college students do not know how to manage internet tools and use them for learning. This is because these skills are not being taught or practiced in K-12 education. While students are adept at using technology for informal learning and networking at home, the students must be

taught how to create and manage technology networks that are useful for classroom learning (Dabbagh and Fake 2017). Most technological skills are acquired outside of school and may not be useful in the educational setting, so students must be taught the proper strategies and techniques for adapting their skills for educational networking (Laakkonen and Taalas 2015). Davidson (2017) explained that many schools and instructors assume that students already have the skills to successfully assimilate knowledge from technology networks, so they do not provide time to teach and allow students to practice these skills.

Instruction on developing and using technology networks should occur in three phases. Learning to acquire knowledge through technology resources requires three phases: the tool learning phase, the content learning phase, and the partner learning phase (Lu 2017). The tool learning phase involves learning how to use and integrate online resources. Students must learn how to effectively search for information and how to understand the information that is provided by a search engine. Often teachers assume that students know how to search for information, but the students may not know how to effectively use key words and phrases in their searches. Taking the time to teach students how to efficiently search for specific information will save the teachers and students time and frustration.

The content learning phase involves assimilating previous knowledge and newly acquired knowledge for the purpose of learning (Lu 2017). In traditional classrooms, this process is accomplished through direct instruction by the teacher; the teacher tells the students what information is important for them to know. In connectivist environments students must decipher which information they received from their research is important and which is unimportant. These are skills that require practice. Teachers should provide lessons that allow students to practice the content learning phase.

The last phase of acquiring knowledge through technology is the partner learning phase which incorporates social relationships to share knowledge. Social networks are as important as technological networks in the connectivist classroom. Aksal et al. (2013) found that students who shared experiences and knowledge through technology increased the skills that are known to contribute to educational success. However, like technology networks, students need to learn how to use social networks for educational purposes.

Helping students to learn to use and manage technology networks can be accomplished through various educational networking sites. An easy way to implement technology networks is to start a class networking site. The students can learn to network on the class site where the networking is managed on a small scale. As the students learn to manage their classroom networks, they will gain the confidence to explore networks on their own, increasing autonomy and network connectivity.

4.5 Incorporate and Practice Utilizing Social Networks

Social networks are the most important aspect of connectivist teaching in K-12 classrooms, and the easiest to implement. Manning (2015) asserted that knowledge is no longer acquired individually, but it is shared and distributed through networks. When achievements are shared among students, they are more motivated to improve their learning (Shan et al. 2014). Social networks focus on shared problem solving and

increase the motivation of the members (Harding and Engelbrecht 2015). Social networks improve social skills and collaboration skills.

Hegedus et al. (2016) completed a study of 566 high school math students in traditional math classes. The experimental group was taught in a traditional classroom that integrated math software that encouraged student discourse, active learning, and group learning over teacher demonstration. Students in the technology-enhanced classroom showed more improvement from the pre-test to the post-test than traditional students. The results, however, were not due to the technology or software implementation. The main difference between the two groups of students was that the technology-enhanced classroom included communication and group work, so students could learn through networks (Hegedus et al. 2016). Students need to be given the opportunity to share the knowledge they gain from technology networks with others. Networked learning is applicable and can be implemented in the traditional classroom setting to meet the needs of digital natives.

Implementing social networks in the classroom moves learners from passive consumers of information to creators of knowledge and content because learning networks encourage meaningful learning and problem solving. Social networks are not controlled by the instructor; they are completely under the control of the learner and the goal is to help one another succeed (Harding and Engelbrecht 2015). Students learn through peer discussions and interacting with classmates (Aksal et al. 2013). In a study conducted by Khan and Madden (2016), 84% of students said they learned a moderate to high amount from their classmates and preferred to work with other students over working alone. Even students who are not comfortable speaking up in class are comfortable interacting in a discussion within their social networks (Ying and Yang 2017). When students are connected in networks, they are more willing to tackle challenging tasks because they know they can rely on peers for help.

Social networks are not the same thing as friendships or collaborative learning. Social networks are groups of people that a learner interacts with for the purpose of learning. Social networks are focused on knowledge distribution and not just social relationships. Social networks that exchange information are more influential than student friendships in increasing student autonomy (Alonso et al. 2015). To encourage student success, teachers need to encourage the formation of social networks, not just focus on classroom friendships or traditional collaborative learning.

Teachers are often concerned about students choosing to work with other students who are not going to benefit their learning. Contrary to expectations, Casquero et al. (2015) found that higher performing students do not network with only other high performers. In a successful social network, group interactions are more important than individual ability and all members contribute to the learning (Alonso et al. 2015). Students form groups that are heterogeneous, and higher performing students drive the interactions and discussions of the network (Casquero et al. 2015). Interactions in social networks are based on access to shared resources, and not focused on the academic performance of the individual. Therefore, high performers lead the discussion which has a positive impact on low performers but does not have a negative impact on high performers (Casquero et al. 2015). Encouraging connectivist networking in the classroom through social networks increases the success of all levels of students.

Teachers who seek to utilize social networks in the classroom need to coach their students on the formation and maintenance of networks. To ensure that students are forming social networks and not just working with their friends, the implementation and practice should be done in phases. First, the students need to have opportunities to interact with classmates who are not their friends. So, implementation should begin with short-term teacher-formed groups. The groups should be changed with every assignment, so the students have an opportunity to work with all the other students in the class in a relatively short period of time. After students have had the opportunity to work with their classmates on at least one occasion, the teacher should coach the students in forming their own networks. Social networks should eventually be in the control of the student, not the teacher, to promote learner autonomy.

5 Conclusion

Students today are growing up immersed in technology, and it has changed the way they think and learn. Unfortunately, most K-12 education remains based in traditional practices that do not benefit the digital natives in the classroom. Digital natives have unique learning styles and communication styles, and prefer to work in teams (Saritas 2015). The time has come for a new pedagogy to address the needs of these students. Connectivism is a learning approach for the digital age that is based on network learning. Four learning strategies utilized in connectivist environments are learner autonomy, resource openness, network connectivity, and opinion diversity (Smidt et al. 2017). This paper presented five practical strategies that teachers in traditional K-12 classrooms can incorporate to implement connectivist learning approaches. Five strategies for implementing connectivism in the traditional K-12 classrooms are (1) shift from teacher-centered to student-centered pedagogy, (2) incorporate technology with readily-available devices, (3) never provide information that students can access themselves, (4) incorporate and practice utilizing technology networks, and (5) incorporate and practice utilizing social networks. Implementing connectivism in the classroom will bridge the gap between traditional K-12 education and the needs of the learners in the classrooms.

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