Examining Theories which Support Online Learning: Ideas for a New Integrated Model

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Abstract

A number of quality theories have been utilized to provide a framework or background for studies of online learning and instruction. While many of these theories have been useful, several have been modified as new technologies have been invented and adopted in schools. This paper examines some of the most prominent theories of online learning and hypothesizes a new model which better integrates many of the most recent technologies and understandings of how people learn in online environments.

Keywords: Models of Online Learning, Online Instruction, Theory

Introduction

The COVID-19 pandemic has impacted education across all levels of learning. For those teaching in colleges and universities across the nation, faculty were forced to move all face-to-face courses to an online only format in order the salvage the remaining five to six weeks of the spring term. Fortunately for college instructors, they have likely encountered some experience with teaching online as the popularity of online courses has increased significantly during the past decade (Lederman, 2019). Those teachers in K-12 classrooms, likely faced a much heavier lift for several reasons. First, very little K-12 schooling is done online, thus the move to online instruction left many teachers with little practical experience and uncertainty for where to start in order to migrate to a virtual learning environment. Secondly, when the pandemic hit, schools were in the middle of the third quarter, thus a significant portion of the school year was yet to come. Coupled with concerns over Advanced Placement and End of Course (EOC) testing, there was still a great deal of learning left to be achieved in most K-12 schools. Finally, and perhaps most importantly, K-12 teachers are primarily dealing with kids whose current grade level and courses serve as critical foundations for the following year. While college students might experience some holes in their learning, elementary student's as one example, may miss major learning benchmarks which could place their future education at considerable risk. While the plight of the different levels of instruction may have differing consequences, it is clear that the movement to online instruction caused a major disruption of learning across all levels of schooling.

Although we are still very early in understating the long-term consequences of the

pandemic's effect on education in the Unites States, some reports are beginning to surface which are revealing many deficiencies of schools and institutions as they worked to provide meaningful learning opportunities for their students. There is no doubt that all schools did their best to implement curriculum and material to support student learning, and the ultimate effectiveness will be a challenge to measure as we did not design a controlled experiment of student learning across the nation. Only time will tell what potential long-term negative impact that this had for our students. Perhaps adding more complexity to the problem, it has been reported that the implementation of online leaning has looked vastly different across the country and this suggests that not all students received the same type of instruction. This has the potential of enlarging the already too wide achievement gap.

The first place that many educators would have looked for guidance in moving to online learning during the pandemic was likely the Internet. Of course, we know that virtually anything can be found in the web but deciphering the quality of that information is challenging. This is particularly the case when searching for things that we are not familiar with. As teachers, professors and district leaders began to search for support as they moved to online instruction, one common phrasing they likely sought out was "best practices for online instruction." Unfortunately, a recent google search turned up 394 million results, perhaps slightly more than a typical person can handle. Coupled with the overload of potential support via online searchers, districts also sent teachers links and books and articles, all with the intent of supporting teachers, but often simply overwhelming them. While the flood of resources may provide encouragement that some nuggets of information may be found, the time and expertise needed to find the best materials can be intimidating.

Background Literature

A Brief History of Online Learning

The use of online learning as the primary avenue to educate students has a much longer history than most would expect. The first systematic efforts to conduct virtual instruction began in the 1950-60s when correspondence courses began as instructional materials were mailed to students. Later in 1984, General Electric, IBM and AT&T founded the National Technological University to provide videotaped courses to student's interested in engineering. The 1990s brought prominence to schools such as the University of Phoenix who became one of the first colleges to offer completely online programs, a move that was soon mirrored by other major institutions as the model for online learning began to become mainstream (Ceglie & Black, 2020). The most recent data from the National Center for Educational Statistics reports that there were nearly seven million students taking courses in degree granting postsecondary institutions in 2018. This finding highlights an astounding fact that nearly 70% of the current student population is enrolled in some type of online college level course (United States Department of Education, 2019).

While these data provide some perspective regarding the prevalence of online learning in higher education, less is known regarding K-12 schooling. Forbes Magazine reports that over 2.7 million students are taking online courses within the K-12 school systems (Forbes, 2019). With roughly 57 million students attending K-12 in the United

States in 2019, this means that just under 5% of students are enrolled in online courses (Bustamante, 2019). This is a significant difference when comparing this to college course taking patterns. However, recent events, specifically the COVID-19 pandemic, is likely to lead to a significant change in the amount of online learning occurring in these levels of schools. In addition, while the prevalence of online learning may differ across all levels of schooling, a large percentage of this disparity is likely due to the age and maturity of those talking courses. We cannot expect a first grader to have the same levels of patience, persistence and motivation as a 20-year-old adult. Regardless of these differences, it is clear that more online learning will be found in future classes as this trend to online learning will continue to expand through the coming years.

Research on Effective Technology Integration and Online Instruction

The research on what exactly constitutes effective online instruction has an incomplete story. As the technology has continued to evolve over the past decades, this has placed educational researchers in the precarious position of attempting to study a moving target. We can start with the premise that online learning in many education settings is still a relatively new phenomena. Thus, before delving into a full exploration of online instruction, it is important to consider how technology integration has occurred in all educational settings. One of the most important "modern" technological tools utilized in today's classroom is the computer tablet. While desktop computers have been around for decades, more effective integrations of technological tools often necessitated mobile devices. In 2010, ipads were the hot new technology finding their way into classrooms across the county. Then, only a few years later, schools began buying Chromebooks because of their comparatively reduced cost. Today, cell phones are a necessary tool for virtually any student in middle school or high school. None of these tools have had enough time to be fully successfully implemented in schools and certainly none have a robust sound research conducted on them, as the shift to new technology and tools is occurring at a lightning pace While there are some quality studies regarding technology use, implementation, and effectiveness, it is important to note the caveat that this research base is not complete.

In one of the most comprehensive studies on the impact of technology on student learning, Tmaim, Bernard, Borokhovski, Amrami and Schmid (2011) conducted a metanalysis where they explored over forty years of research on educational technology. While this study does cover types of technology no longer used in today's schools, the findings illustrate the idea that instructional technology-based tools do support improved learning outcomes. Based on the 37 total studies that were analyzed, "a significant positive small to moderate effect size favoring the utilization of technology in the experimental condition over more traditional instruction" was found (p. 13). They conclude that the average student in a class that uses technology as a part of the class activities will perform 12 percentage points higher than the average student who does not use the same technology.

A review of the literature which explored the effectiveness of technology-based learning in higher education environments was completed in 2014. Kirkwood and Price (2014) examined studies conducted from 2005-2010 and included a total of 47 unique articles. In their analysis, they note that "The potential of technology to transform teaching and learning practices does not appear to have achieved substantial uptake, as

the majority of studies focused on reproducing or reinforcing existing practices" (p. 24). This points to the inherent difficulty in actually measuring achievement gains as they found inconsistent methods, assessment tools, and concerns of lack of theoretical underpinnings in many of these studies. There findings are consistent with other scholars who have expressed concern for how technology does improve learning outcomes in students (Cuban, 2001; Guri-Rosenbilt, 2009).

One important meta-analysis conducted by Zheng, Warschauer, Lin and Chang (2016) aimed to understand how laptop use, both in and out of class impacted learning. Their study reviewed 65 journal articles, and 32 doctoral dissertations published between 2001 and 2015. The focused on ten specific studies and focused on an exploration of the impact of one-to-one laptop programs. As the digital divide is potentially reduced across the county, a one-to-one student to device ratio is becoming a reality. While this includes devices supplied by the schools and those owned by students, it better represents what many schools are moving toward or have already achieved both in and out of the brick and mortar walls of the school building. The researchers found a small positive effect size of .16. While this result is positive, they note that

> Though our analysis corroborates and extends many of the positive conclusions from earlier syntheses of one-to-one computing, it is far from the last word on this topic, in part because a disproportionate amount of the research to date on this topic consists of small case studies in one or a handful of schools. The number of studies identified that deployed rigorous experimental or quasi-experimental methods was small, making meta-analysis difficult, and making it impossible for us to conduct moderator analyses. In addition, studies on this topic have largely done a poor job of assessing learning outcomes that are not well-captured by current iterations of standardized tests. (p. 1076)

Research which specifically examines what effect mobile devices such as laptops and cell phones have at improving learning outcomes were examined in a research synthesis by Sung, Chang and Lui (2016). Since the use of laptops, smartphones and tablets serve as the foundation for online learning as well as many applications to in-class technology-rich activities, studies that explore their use is a valuable contribution. Sung and colleagues started their analysis by limiting studies to experimental and quasi-experimental studies and found 110 such studies conducted from 1993-2013. Similar to what was found by Tmaim, Bernard, Borokhovski, Amrami and Schmid, their analysis found a moderate mean effect size of .523. In the conclusion, the authors note that there was a range of effects based on different devices used, how they were implemented, and what learning goals were aimed to address. The explained

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Transitioning to online instruction research, studies focused on the impact of online instruction as an effective delivery method for teaching have not reached

consensus as there are not enough quality-controlled studies. There is evidence that online instruction can be just as effective as face-to-face learning, but caution must be used because of the limits of the current research base. Regarding K-12 instruction, the United States Department of Education (DOE) conducted a meta-analysis in 2010. They found that on average, those who engaged in online instruction, "performed modesty better than those receiving face-to face instruction" (US DOE, 2010, p. ix). In conclusion, they warn that the number of studies available was small. Perhaps more importantly, there are virtually no systematic or meta-analysis studies on online learning at the K-12 schools since this DOE report.

Online learning at the college level has a more robust research base. A Brookings research study examined the impact of online study on college students attending DeVry University. In one of the largest studies available, they obtained data from over 230,000 students enrolled in 168,000 sessions of more than 750 different courses at DeVry. Since the DeVry courses are offered both in person and online, this provided one of the best comparisons of the types of learning available. They found that taking a course online reduces a student's grade point average (GPA) by .44 points (Bettinger & Loeb, 2017). In addition, taking a course online reduces a student's GPA by .15 point in the following term. They also found that taking a course online, instead of face-to-face increases the likelihood that a student will drop out of school. Students are approximately 9% less likely to be enrolled in college the semester following a student taking an online course. While some caution must be used with this study as it is limited to only one institution, the sheer number of data available in the study provides some compelling evidence to question online learning's effectiveness.

A recent report conducted by Spiros Protopsaltis, director of the Center for Education Policy and Evaluation at George Mason University and former aide in the Obama administrations Education Department, and Sandy Baum, a fellow at the Urban Institute and professor emerita of economics at Skidmore College, examined the impact of online courses on socioeconomic and racial achievement gaps. The study (2019) found that while online education is the fastest growing segment of higher education, it is not meeting the needs of all students. They conclude that "The consensus that emerges is that learning outcomes appear to be the same as in traditional courses" (p. 14). However, they found that students labeled as underprepared and economically disadvantaged underperform, in addition, achievement gaps between them and their peers is wider for online learning platforms. This work is consistent with the Bettinger and Loeb's research and does not provide a positive portrayal of online learning in colleges and universities. Where there have been some smaller studies that do challenge these studies (e.g. Shea & Bidjerano, 2014) it appears that much of the online learning research has focused on areas other than student outcomes and thus mixed results have become the status quo for these types of studies.

Collectively, this survey of studies related to technology integration and online learning provide support that technology *can* have a positive effect on student learning, although there is just as much evidence for the contrary. While this isn't the most optimistic finding, as the use of technological-based tools is ubiquitous in today's schools, it clearly demonstrates that more focused research is necessary. In cases where positive achievement was demonstrated, we have evidence that if utilized appropriately, technology can be used to provide similar student outcomes in online settings. One major

challenge is that the pace that new hardware and software is being used and replaced adds additional impediments in measuring the exact impact of any one tool. The consensus is that we need more systemic research but measuring the impact of a changing landscape will continue to be a major obstacle. Regardless of the critiques, there does appear to be some clear benefit of technology and its use for learning, however, we also know that the implementation and effective use of these tools can vary across different environments.

Theories Supporting Effective Online Learning

One potential impediment to successfully employing technology in today's learning environments is a clear understanding of how learning theories apply to technology-based practices. As noted above, one challenge to studying effective online learning is that many studies lack a clear theoretical foundation, This is unfortunate, as there are numerous learning theories that are applicable to the 21st century learner, and many of which are very applicable to online learning. Perhaps the best synthesis of research on learning was conducted by Bransford, Brown and Cocking in their book *How People Learn* (2000). In this synthesis, the authors suggest that there are three key findings that have impactions for teaching. First, that students come to school with preconceptions for how the world works and if their initial ideas are not engaged, they often fail to grasp new material and in many cases, return to their original faulty conceptions. The origination of these early ideas is not particularly important, rather having opportunities to challenge them provides long-term understanding. Second, in order to master material, students must have a deep foundation of factual knowledge, understand these facts in the context of some conceptual framework, and must be able to organize knowledge in ways that facilitate retrieval and application. The memorization of discrete disconnected facts does not lead to meaningful learning. Having a deep understanding with a supported framework for information allows the learner to connect and synthesize new information and ultimately allows them to apply these understandings to new situations. Thirdly, there is a high value is using a metacognitive approach to learning as this can help students take ownership in their learning. This leads to the creation of learning goals and links with self-regulated or monitoring of their own learning progress. Taken together, these three ideas serve as the best research-based evidence for how to support the most favorable learning outcomes.

These findings have clear application and connections to the latest research and integrate areas such as psychology, neuroscience, biology, anthropology and other disciplines. These three areas demonstrate a consistency with sociocultural theories which have been heavily utilized in the 21st century which emphasize that we are social beings, and this plays an important role in our education. The integration of metacognitive approaches is consistent with the most recent efforts by educators to help students be more flexible and cognizant of their own thinking. The implementation of self-regulation is also apparent and aligns nicely with some of the emergent technology tools where personalized learning can be achieved with the implementation of computer software.

As we enter the golden age of online learning and the heavily technologically enhanced instructional methods become more common, we are left to consider how Bransford, Brown and Cocking's work will apply to that instruction. Online learning theories have been consistently evolving in response to the ways that the technology has

evolved. One of the most widely applied learning theories is behaviorism, which suggests that learners respond to environmental stimuli and that an individual's behavior is either positively or negatively reinforced by the outcomes. These reinforcements then influence future learning as behaviors are acquired, reinforced, or deterred, thus, influencing future learning experiences (Skinner, 1938). With respect to online learning, the use of "rewards" and "punishments" can often be observed for how feedback and assessment methods work. Providing positive feedback to students, and in best case received in quick fashion, promotes future learning and engagement. Online software often utilizes tools which can provide immediate feedback, something that may be harder in a face-to-face environment. This can serve to correct and direct learning in ways that build confidence and support in the learner. Constructivist learning theory evolved through work by Piaget and Vygotsky as they applied new understandings for how the cognitive processes work. This theory supports the idea that learners gain knowledge and skill through active engagement in educational activities. While Dewey is often credited with early thoughts on hands-on and inquiry models of instruction, his work parallels constructivist ideas. Collectively, constructivist ideas support the notion that learning is an adaptive activity which has clear applications for online learning (Boethel & Dimock, 2000). Adding the social domain to this and we have social constructivist learning theory which stresses the importance of social activities to learning. Social learning theory posits that knowledge and skill is constructed as learners engage in activities, receive peer and instructor feedback, and participate in related interactions in a social context (Henning, 2004). This theory has a strong application to the type of online learning design which is used. In a fully asynchronous course design with little peer-to-peer interaction, social interaction is limited. However, courses which may utilize synchronous learning and supports peer-to-peer interactions lends themselves well aligned with this theory.

Two other important theories make strong contributions to understanding how students learn within online environments. Alfred Bandura (1993) championed the importance that self-efficacy has on learning. His work indicates that one's self-efficacy influences the likelihood in participating and remaining engaged with learning tasks. Online learning activities which reinforce the growth and confidence of the learner build these skills in an accumulative fashion. On the contrary, "If an individual believes that he/she cannot achieve the results, they will not make any effort to make things happen" (Alqurashi, 2016, p. 45). This applies to both the course content and the design of a course. Should a course be poorly designed and foster anxiety and frustration in the learner, then the quality of the content will likely be tarnished. The role that motivation has in learning is strongly correlated with self-efficacy beliefs. A strong motivation on the learner's part is correlated with course retention, persistence, and satisfaction (Chen & Jang, 2010). Motivation as applied to online learning, supports the need to build course content and delivery which is interesting, engaging, and applicable to the learner. In addition, the environment, both the social environment and course layout are also factors which can support motivation and the learning outcomes in an online course. One application of motivation is self-determination theory which has been studied using the foundational work by Deci and Ryan (1985). Self-determination theory is an umbrella framework for several underling factors which contribute to human motivation. This theory postulates that and individual's experiences and motivation are influenced by the degree of one's autonomy, competence, and connection. Deci and Ryan see these three

factors as psychological needs that when met, can lead to positive learning outcomes. For online learning, these motivation factors can be inhibited or supported based on both intrinsic and extrinsic factors. Design factors such as opportunities to build connectedness and social interactions, as well as positive feedback experiences will support stronger learning. The learning can be mediated through increased course engagement, opportunities for satisfaction, and evidence of achievement.

One final appliable theory for effective technology integration and meaningful online learning relates to the importance of sense of community which is fostered in most successful learning environments. Etienne Wenger (1999) pioneered this idea as an attempt to conceptualize four critical elements which serve at the foundation for social learning and include 1) identity, 2) meaning, 3) practice, and 4) community. Communities of practice are built as learners work together to make meaning as they interact and collaborate on shared activities. While communities of practice are not essential for online learning, research suggests that they can help mimic the face-to-face classroom environment and support learners enrolled in online coursework (Lai, Pratt, Anderson, & Stigter, 2006; Smith, Hayes, & Shea, 2017).

One offshoot of the work by Wenger focuses on how an individual can become engaged in the larger online social community in a course. Sense of belonging (SoB) which can be defined as acceptance and value experienced by an individual where they become connected to a given experience. This concept has been increasingly utilized but one of the first important studies was conducted by Sylvia Hurtado and Deborah Carter (1997), where they found that a strong sense of belonging was associated with positive outcomes for Latino college students. The concept of sense of belonging is also consistent with the pioneering research on academic progress and college student attrition by Vincent Tinto (1997). In fact, Tinto highlighted the importance of community building in his research on face-to-face learning environments. The application to online learning is clear when one considers how instructors integrate current technology tools to build an inclusive, and supportive communities of learners in online courses. These communities are facilitated by the instructor who serves as a mediator and designs learning activities that engage the students in active and socially based learning experiences. One important part of these communities is a successful building of a sense of belonging (SoB) on the part of the learner. Work by Peacock and Cowan (2019) supports the idea that effective learning in online platforms are largely dependent on one's ability to feel a part of the community of learners. They note "Educational research suggests that students who feel accepted and valued, that they are important to the life and activity of the class, develop a strong SoB, which is important for all" (p. 78). Other studies have also found that a strong sense of belonging is also valued by learners which in turn leads to improved learning experiences within their online courses (Thomas, Herbert & Teras, 2014).

There are certainly other theories which have applications to technology use and online instruction, but the collective list described above is a culmination of those that have the strongest research foundation. Collectively, these theories provide many different starting points for exploring learning. Some theories focus more on the design of a course while others highlight the type of experiences that are practiced by a learner. The intent here was to be inclusive to theories which would apply to how technology can be implemented in a classroom while at the same time focusing on the actual experiences of a learner enrolled in an online course. None of these theories were specifically designed

to help explain online instruction or technology integration, rather they are theories that one would expect are applied in any online or technology specific learning theory or framework.

It can be hypothesized that any framework which is reported to support online learning would utilize one or more or the previous mentioned theories to serve as its foundation. Perhaps the most appropriate place to begin any discussion of theories of online learning would begin by reviewing the TPACK framework. TPACK or technological pedagogical content knowledge is an application of Shulman's (1986) pedagogical content knowledge work. The key distinction is the addition of technology and how technology can be meaningfully integrated into other content areas. This framework is predicated on a consistent understanding of pedagogical content knowledge. In Figure 1, a presentation of TPACK depicted which shows that technological knowledge (TK) must integrate with the content (CK) and pedagogy (PK) that are unique to any specific comtent area.

Figure 1
*TPACK Framework*. Reproduced by permission from tpack.org (2012).
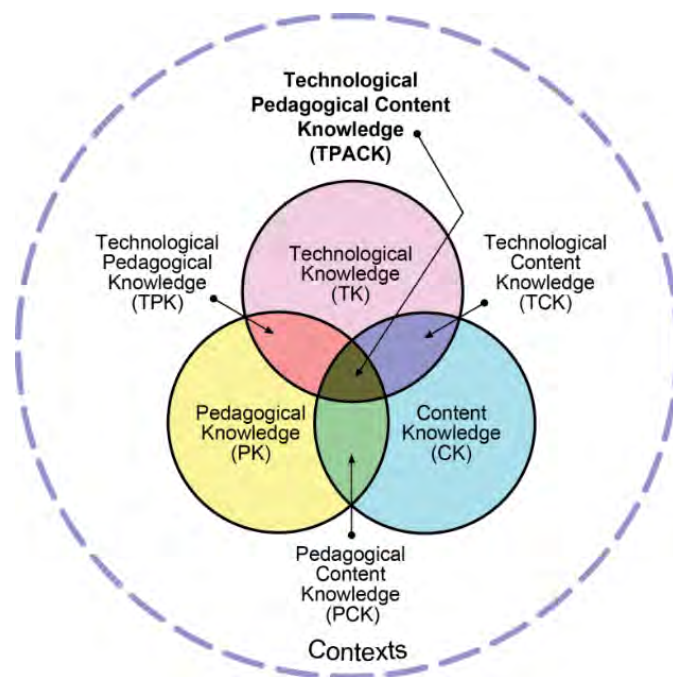
While this model for integrating technology is a useful tool to remind curriculum designers and teachers of the interplay of these understandings of learning, many of the research studies which explore this model only focus on how teachers utilize or integrate technology. Only limited research has examined how this model is appropriate for guiding online instruction (e.g. Ward & Benson, 2010). Given its use in so many studies on technology, it would be expected that it could apply in some way to how information is understood in an online environment. Although numerous studies use the TPACK framework, several studies have questioned its true value. Graham, Borup and Smith (2012) question the unnecessary complexity and uncertainly in the current TPACK

framework and state that it "adds a significant level of complexity to the already complex PCK framework by more than doubling the number of framework constructs (from three in PCK to seven in TPACK)" (p. 4). While there exists many studies which have successfully applied the framework, there is still uncertainty in creating a precise definition for this framework and its seven knowledge constructs which have been outlined (Graham, 2011). Yet despite this large body of work, it appears as though little progress has been made towards providing either a simple, precise definition of the TPACK framework or developing a robust way to measure it (Graham, 2011). In addition, although the original framework was intended for teacher educators, it's been applied across many areas and in numerous surveys. Brantley-Dias and Ertmer (2013) question the use of TPACK and "suggest that the construct, as it currently exists, is both too vague and too intricate." They believe there is value in the model but "additional clarification and conversation is needed to adequately guide future educational efforts aimed at preparing both teachers and students for the 21st century" (p. 123). It is expected that this framework will continue to have value, other ideas which better align to online learning have been postulated.

One of the simpler models for online learning was created by Garrison, Anderson, and Archer (2000) and they refer to it as the Community of Inquiry Model and is depicted in Figure 2. This model has clear links to social constructivist theories as it hinges on the idea of several elements of "presence" which are integrated to build a learning experience. This model suggests the importance of the teacher to facilitate a supportive environment. This idea connected with work by Wenger with the emphasis on community building. The second presence presented here is the social presence, which is built by the learners in concert with the teacher. Finally, cognitive presence which hinges upon an understanding of the content which aligns with the Bransford, Brown and Cocking work. One of the highlights of this model is that is has clear emphasis on the type of interactions which can occur in an online course. For example, sharing of ideas via a teacher facilitated discussion board or through group meetings would contribute to the learning experience as one integrates the appropriate content. However, it is also suggestive that a class without these features would be less effective to building the learning experience. This does not negate teacher or social presence, but one might consider if an effective online experience can occur devoid on one of these. One could argue that online courses originated without much social presence and many continue to do so even today.

Figure 2

Community of Inquiry Model. Redrawn from original in Garrison, D. R.,
Anderson, T., and Archer, W. (2000)
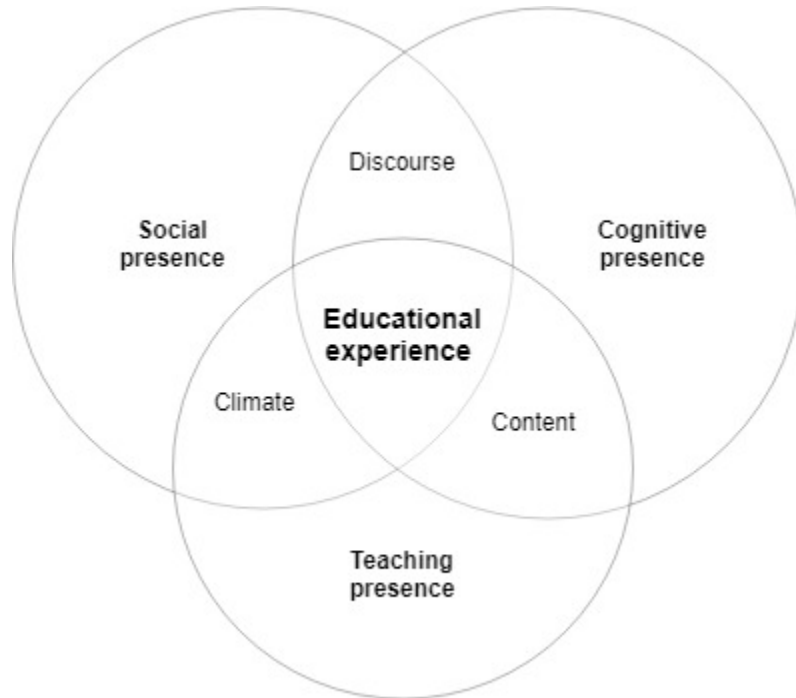
An extension of this work can be observed in more recent work by Terry
Anderson (2011) in a paper where he discusses the feasibility of creating an inclusive
theory of online learning. In his theory discussion, he calls attention to several of the key
pieces from the Bransford, Brown, and Cocking (1999) study which provides the
foundation of his ideas. He suggests that a theory should be learner-centered, knowledge-
centered, assessment-centered, and community-centered and he argues that these align
well with prior research. In addition, he expresses that the type of interaction that occurs
within an online course is critical to create an effective learning environment, something
which we have seen in social learning theory. In Andersons' model, he integrates the
interactions that exist between leaners, teachers, and content and examines how these
interactions exist in an online environment. Simply described as an Online Learning
Model is depicted in Figure 3, it places the content at the center with the student and
teacher at opposing ends both interacting with content and each other. Another strength in
this model is that is embeds some of the most common tools used on online courses such
as simulations, virtual activities, and various forms of communication. This model also
embeds the community of inquiry idea presented earlier. It is important to consider how
much of this model hinges on the learning resources and activities which must be
designed to meet the needs for this type of learning. The new tools such as simulations,
video instruction, and "just in time" content, and other support afforded by emergent
technologies, allow for a much richer and personal learning experience for the learner and
mimics what can be done in a face-to-face environment. In conclusion Anderson explains

Our challenge as theory builders and online practitioners is to delineate which modes, methods, activities, and actors are most effective, in terms of cost and learning, in creating and distributing quality e-learning programs. The creation of a model is often the first step toward the development of a theory. The model presented illustrates most of the key variables that interact to create online educational experiences and contexts. The next step is to theorize and measure the direction and magnitude of the effect of each of these variables on relevant outcome variables, including learning, cost, completion, and satisfaction. (p.55)

Figure 3
Anderson's Online Learning Model. Reprinted with permission by Anderson, T. (2011).
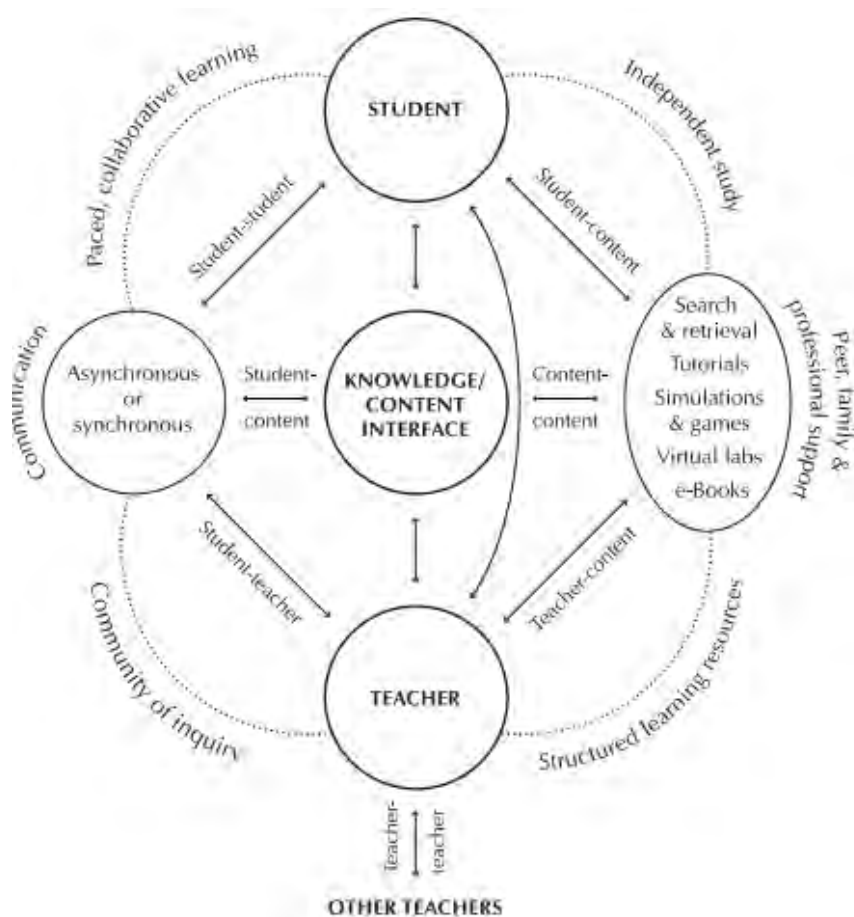
One potential weakness in this model is that it assumes all interactions occur in the virtual environment and that hybrid learning is not taken into consideration (Picciano, 2017). While this does not negate Anderson's work, some more recent studies have explored how this can be integrated into a blended online learning theory which incorporates fully online and hybrid environments as a more thorough integration of synchronous and asynchronous learning. Shea and Bidjerano (2010) tackled blended learning theory using a combination of theories related to self-efficacy and self-

regulation. In this study, they take a step back from Anderson's current work and return to the community of inquiry model and apply this to blended learning environments. In their view, self-efficacy is the medium between teaching, social, and community presence as depicted in Figure 2. Although their final model looks very similar to the original community of inquiry framework, a consideration of a more expanded view of online learning is worthy of consideration, as their study is significant. Their work employed data from over 3000 students who had recently enrolled in at least one online course and is one of the larger studies of online learning.

One more recent attempt at a unifying model of online learning is an adaptation of Anderson's model, termed the Multimodal Model for Online Education, which was put forth by Anthony Picciano (2017). This model as depicted in Figure 4 and provides a more practical framework for online instruction.

Figure 4
Multimodal Model for Online Education. Reprinted with permission, Picciano (2017).
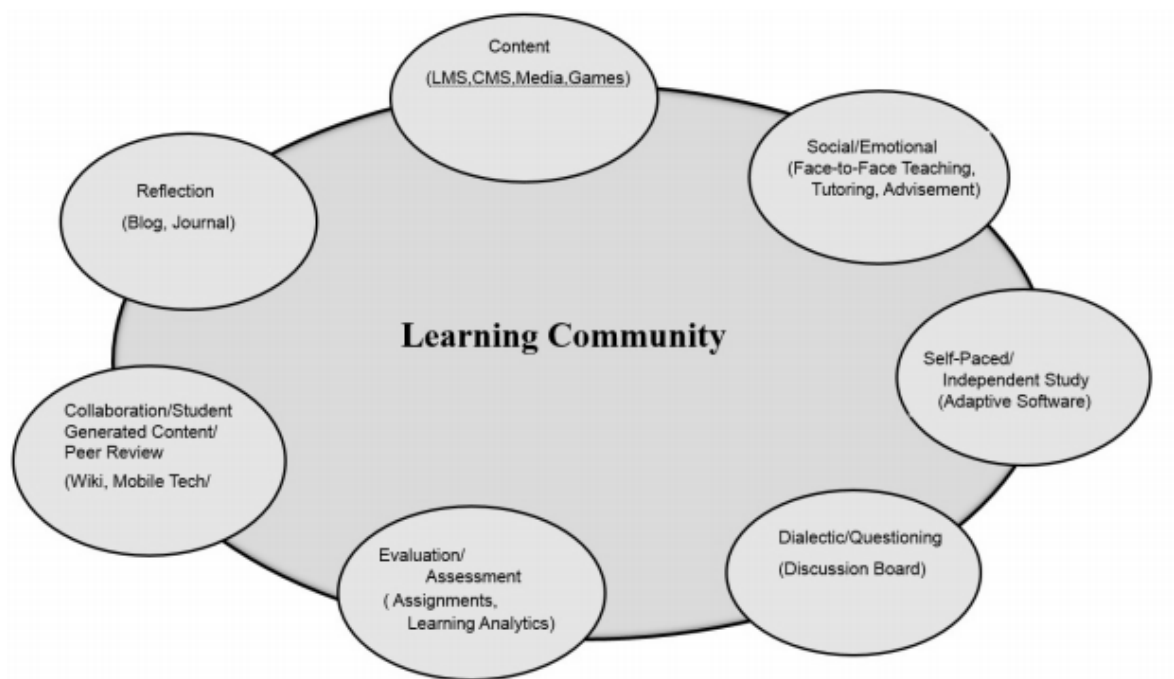
Picciano notes that this model is founded on the work of blended learning technology, generations, personality types, learning styles, and cognitive science. It recommends that pedagogical objectives and activities should drive the approaches that faculty use in instruction. Picciano also suggests that combining the objectives, activities, and approaches within multiple modalities might be most effective for and appeal to a wide range of students (Picciano, 2009). However, a glance of the visual representation of the model suggests that this is a very modest framework and much of it simply displays the connection of learning activities typically found online and how they all integrate to build an effective learning community. If viewed as a practical framework for

instruction, it does provide some guidance for those curriculum designers, even with the lack of depth. In addition, unlike Anderson's model, this allows for blended and hybrid approaches to online learning, thus it serves a greater range of needs.

One final model of online learning is very recent work by Borup, Graham, West, Archambault and Spring (2020). In their article, they put forward the Academic Communities of Engagement (ACE) framework. The background of this framework is taken from Vygotsky's work on zones of proximal development. The model "describes a student's ability to engage affectively, behaviorally, and cognitively in an online or blended course independently and with support" (p. 807). Figure 5 provides one depiction of the ACE framework, although the article provides many other representations of the relationships that emerge. In fact, many of these figures are quite in depth which may be a way to help explain relationships, but it becomes difficult to visualize them in a simplistic model. The authors note that

> The ACE framework provides a useful perspective for viewing blended and online learning contexts. Considering a learning environment, a scholar can apply the ACE framework structure to analyze personal and course communities and the levels of support provided by each. (p. 823)

Figure 5
Representation of ACE Model. Redrawn from Borup, Graham, West, Archambault and Spring (2020).
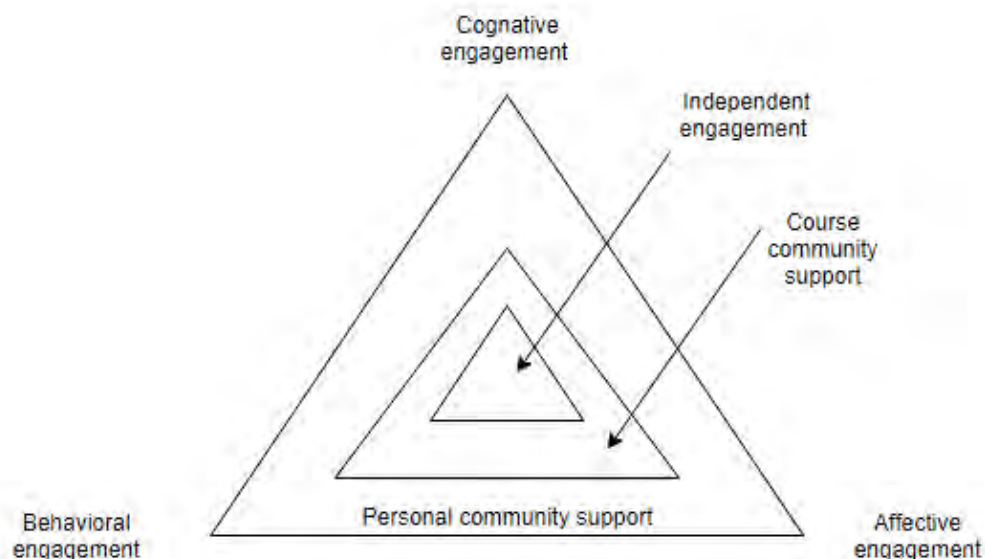
This analysis of course communities is supported later when they explain "This framework represents a conceptual understanding of the forms of support necessary to promote students' academic success as well as the communities that can provide them" (p. 827). Taken at face value, this model offers us a more complex representation of the supports needed to ensure student success. However, one could argue that the complexity of the various components presented in the paper are hard to conceptualize. In addition, unlike other models, there is a lack of clear connection to the technology tools and

content is largely absent and this has not yet been applied in any other studies.

Moving Forward

Collectively, the theories and frameworks presented here are some of the most widely cited and referenced tools used to support the theoretical construct or a model for online learning. A challenge with any online theory is the pace at which online learning evolves. Every few years new tools become available and utilized, and often times they replace hardware or software which was never empirically evaluated. A new theory for online learning must be broad enough to encompass the relevant learning theories while at the same time be agile to be adapted for new technology tools and practices as they emerge. While the current theories all provide important elements, which can be used in designing online instruction, it is also clear that new or revised theories are becoming used and then thrown out as newer ideas are put forth. A useful exercise is to examine the common elements of the aforementioned theories and test their alignment with the relevant learning theories which are utilized in effective learning environments.

Figure 6 depicts a qualitative comparison of the major learning theories with the previously described online learning theories. To add to the theories, two columns were added which focus on the emphasis of content and technological tools, as those are important factors to consider in any theory. While this depiction is not meant to be a quantitative evaluation of any theory, it does provide an indication of which theories align with the different overarching learning theories. Based on this comparison, it is clear that the ACE model and Anderson's model for online learning embed the most comprehensive learning theories. Perhaps these two theories provide different guidance based on what specific elements of online learning one is evaluating. Additionally, conceivably a different model would offer a more flexible framework and integrate all the various aspects. For example, the ACE model as depicted in the triangle, but this makes it difficult to conceptualize the underpinning ideas which are absent in the model. In addition, it is difficult to determine where content and tools intersect with this model. As noted earlier, Anderson's model relies heavily on online learning and does it pay much homage to self-efficacy. One consideration when evaluating these models is to explore how well they are actually employed by teachers and other educators who design or implement curriculum.
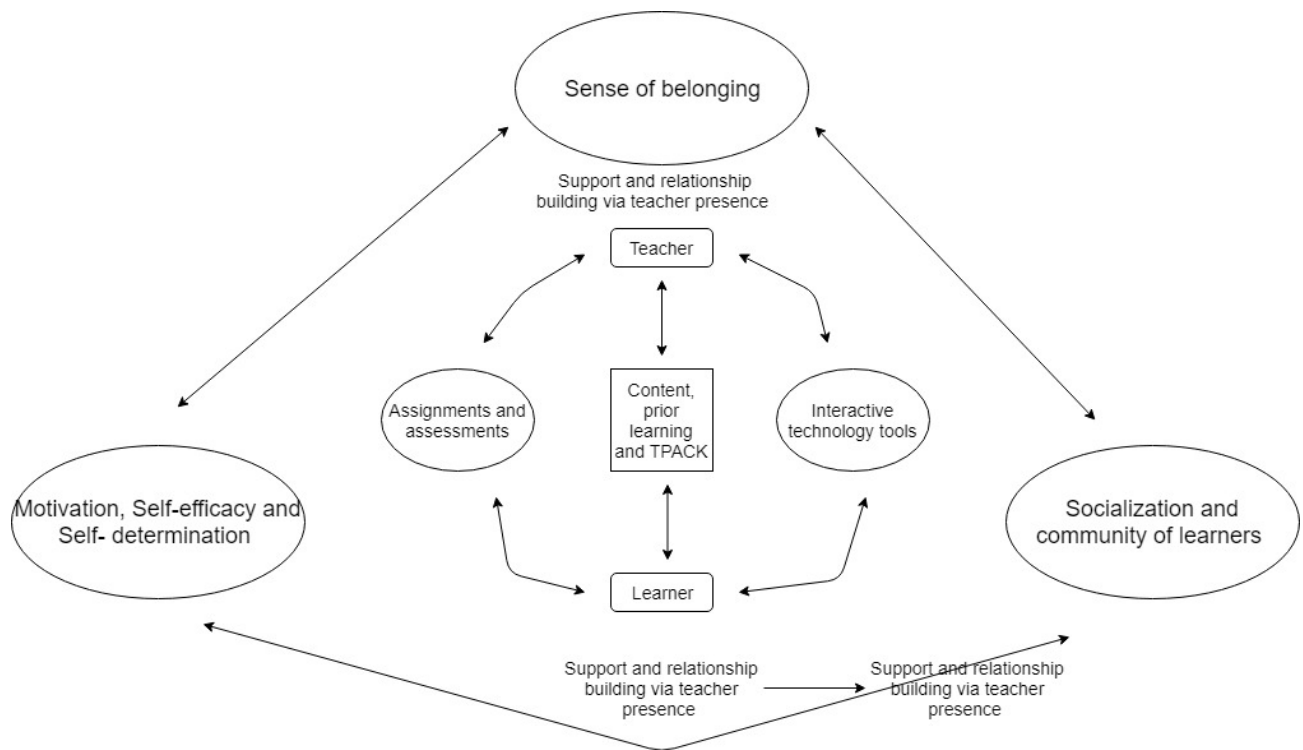
Figure 6

Comparison of Learning Theories and Online Models

		Learning theories, Content and Tools							
		Social construc-tivism	Self - efficacy	Motiva-tion and self-determin-ation	Bransford, Brown and Cocking	Comm-unity of practice	Sense of belonging	Focus on content	Focus on tools
Online learning model/theory	TPACK				X			XX	X
	Comm-unity of inquiry	X		X	X	XX	X		X
	Andersen online learning model	X		X	XX	XX	X	X	X
	Multi-modal model for online education	X			X	XX	X		XX
	ACE model	X	X	X	X	XX	X		X

Key: X= minor emphasis, XX= major emphasis

Efforts to design a framework which encompasses the most relevant learning theories and online learning frameworks appears to be something that is becoming more common as several of the previously described frameworks have been proposed in the past decade. It would be expected that a formal presentation and eventual acceptance of a new framework would need to be vetted by other experts in the field and later empirically evaluated if possible. What follows in Figure 7 is a proposed draft on an integrated online learning framework as a first start at aligning the relevant current theories into one cohesive model.

Figure 7
Integrated model of online learning

Sense of belonging

Support and relationship building via teacher presence

Teacher

Assignments and assessments

Content, prior learning and TPACK

Interactive technology tools

Motivation, Self-efficacy and Self-determination

Learner

Socialization and community of learners

Support and relationship building via teacher presence

Support and relationship building via teacher presence

This model places the content and ideas related to TPACK and content knowledge expertise at the center, which is immediately flanked by the teacher and learner. As the learner is the one interacting with the content, knowledge, and skills attained in a course, and the teacher is delivering these, it is logical to have them at the heart of any model. Considering the methods used in an online course to promote the content, the learning activities and assessments built into a course are central to the achieved objectives. In addition, the types of interactive activities and engaging technology-based tools which online learning provides are interrelated. These serve as the primary vehicles for the consumption of the knowledge and skills. Thus, the center of this framework is primarily related to the content and the technology-based tools which are utilized by the learner. On the periphery of the model, lie three of the most relevant categories which appear to impact effective learning environments in online settings. The community of learners and socialization of an individual in a course is fostered through the course design and content and also connects with the communication and community building within a course. Motivation, self-efficacy, and self-determination are theories related to persistence and course completion and they strongly correlate with effective learning environments. Research is strong on how a teacher has the ability to support a strong sense of belonging and this would be true in an online course. What surrounds these three outer bubbles is a reminder that "support and relationship building via teacher presence" activities within a course help bind those ideas and support a positive learning environment.

Conclusion

The examination of research-based learning theories and their application and integration into online learning frameworks suggest different levels of alignment. Since a growing body of research supports the importance of the affective domains of learning, theories which utilize community building, teacher presence and supports motivation, engagement, and sense of belonging are highly valued in any comprehensive online learning framework. The current theories and frameworks for online instruction have offered guidance as the online learning environment has evolved, but teachers also need a practical-based model which encompasses the latest and best ideas as to what leads to effective online environments to support learning. The proposed framework is a draft of a more integrated model which is flexible but also inclusive of the best learning theories. Next steps are to explore in what ways this framework can be tested in real learning environments. Application of this model will allow us to continue to refine these theories and better support teachers and curriculum designers who work in educating students in online environments.

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