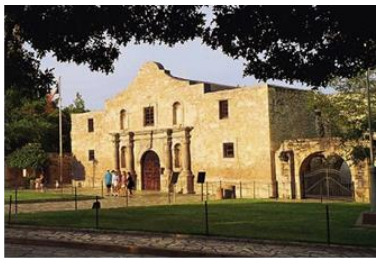
**University of North Texas**

**College of Information**

**2013 Research Exchange Conference**



**San Antonio, Texas, United States** **June 19, 2013**

# Conference Proceedings

**Conference organized by the Department of Learning Technologies**

# University of North Texas

## College of Information

## 2013 Research Exchange Conference

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Welcome to the First Annual College of Information Research Exchange Conference, which is being held in conjunction with the 2013 Learning Technologies Ph.D. Summer Meeting. This research conference is designed to promote, encourage, and expand current and future research among students and faculty.
I applaud the efforts of the conference organizers, presenters, and participants for making this first conference a success. The future holds only further growth and accomplishment as our doctoral student activity in the college grows.
This year's distinguished speaker is Dr. Paul Resta, who holds the Ruth Knight Millikan Centennial Professorship in Learning Technology and serves as Director of the Learning Technology Center in the College of Education at the University of Texas at Austin. He currently serves as the President of the International Jury for the United Nations Education, Scientific and Cultural Organization (UNESCO). He has been awarded the King Hamad Bin Isa Al-Khalifa Prize for the Use of Information and Communication Technologies in Education. Dr. Resta has been a leader in the field of Learning Technologies for more than four decades. We welcome Dr. Resta to the conference and thank him for sharing his wisdom and knowledge about the future of Learning Technologies.

I hope everyone has a successful and productive conference.

Best Regards,

Herman L. Totten

Herman L. Totten, Dean
College of Information

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# ARCS Instructional Design Using VoiceThread

Whitney Kilgore
Department of Learning Technologies
University of North Texas
United States
wkk.texas@gmail.com

Leah B. Mangrum
Department of Learning Technologies
University of North Texas
United States
leah@unt.edu

Jennifer Miller
Department of Learning Technologies
University of North Texas
United States
Jennifermiller254@gmail.com

**Abstract:** Teaching is a difficult task when learners are not engaged, motivated, and curious. Learning occurs within a person, the experience is unique to the individual. Studies have shown that motivated learners can expect 16% to 38% increases in achievement (Huett, Moller, & Young, 2008). This paper will address the methods that can be leveraged to engage online learners, tap into their curiosity, and boost confidence. Through the use of the ARCS motivational model established by Keller, educators can tap into both extrinsic and intrinsic motivation of the learners.

## Introduction

Online learning continues to grow exponentially with the increase and diversity of online learning platforms, course offerings, users, and instructional design approaches. Durrington, Berryhill, & Swafford (2006) find that the "availability of distance education opportunities has burgeoned." There are many challenges facing online learning environments. For instance, learning quality, providing interaction within online learning environments, and providing appropriate courses to meet growing student expectations are all challenges facing participants in online learning environments (p. 190). Durrington, Berryhill, & Swafford (2006) stress the importance of providing interactive collaboration to strengthen instructor and student relationships to produce a more satisfactory learning experience (p.191). ChanLin (2009) study, *Applying motivational analysis in a web-based course*, uses the ARCS Motivational Model to examine motivational problems related to student's devotion to lessons and courses in a web-based environment.

John Keller's ARCS model is explored as an advanced instructional design approach in this paper because previous research on this topic indicates that motivation can improve a learner's willingness to communicate, participate and retain information presented (Shellnut, Knowltion, & Savage, 1999; Hodges, 2004; see also Lee & Kim, 2012). Executing motivation throughout instruction can encourage students to focus on their learning goals and precipitate action into defining their approach to the material.

## Literature Review

Keller (2008) points to four conditions (attention, relevance, confidence, and satisfaction) core to causing learner satisfaction via managing of both intrinsic and extrinsic learning outcomes. Attention is "capturing the interest of learners and stimulating the curiosity to learn" (p.176).

Attention is the first motivational element necessary for learning. Shellnut, Knowltion & Savage (1999) point out that Keller's emphasis of capturing attention is necessary throughout the lesson. Visuals are very important to building relationships necessary to sustain attention. One way to capture attention is to utilize white space appropriately (p. 103). In addition, Keller's ARCS model suggests variability in the delivery of instruction to maintain motivation (ChanLin, 2009). Introduction of new web technologies may be incorporated into lessons to provide variability in the instruction. Varying delivery methods including, text, video, and imagery aid in capturing student attention (Shellnut, Knowltion, & Savage, 1999, p.103).

Confidence is best described as "helping learners believe/feel that they will succeed" (Keller, 2008). Huett, Moller, & Young (2008) posit that providing feedback and criteria will help learners believe they will be successful and will foster the desire for self-directed or control over learning outcomes.

Keller (2010) mentions that in face-to-face instruction, the instructor can gauge student motivation and adjust accordingly but it can be difficult in self-directed learning environments to "reflect the range of motivational conditions that characterize learners at different points in time" (p. 271). Innovations in technology provide strategies to feedback in the online environment. Clark (1994) highlights the instructional method of feedback, describing how feedback is used within a variety of media but the benefits of feedback (motivation, etc.) will still be an outcome of the instructional method through all types of media (p. 8).

Relevance connects personal learning goals to provide a greater depth of meaning during instruction. Relevance encourages positive attitudes towards learning (Shellunt, Knowltion & Savage 1999, p. 105). Hodges (2004) examines studies in which the ARCS model is used as an example of best practices for Web-based learning. Hodges identifies Relevance as the most reported successful motivational strategy in Web-based settings; examples include case studies and reflections on work experiences. Satisfaction, the last motivational component of the ARCS model, helps learners overcome fears of failure and can be established by rewarding the learner for exemplary work (Huett, Moller & Young, 2008, p. 115-116).

The components of the ARCS model can be incorporated into online instruction to enhance motivation individually or as a complete unit. Zhang, Cheng, He & Huang (2003) measures Attention and Confidence factors in a web-based distance learning system; this study proposes the ARCS method to grasp the learner's motivation.

Jokelova (2012) examines the roles of Relevance (value) and Confidence (positive expectancy for success) in a blended public speaking course to determine which of these factors contributed more to student motivation. The results of this study did not exhibit differences between the two factors regarding academic performance or additional motivational strategies. However, "Compared to experimental groups, at the end of the study, the control group reported significantly higher self-perceived public speaking competence. Also, compared to experimental groups, control group members reported higher levels of agreement with the statement *I became a more effective public speaker than I was at the beginning of this course"*(p. 143).

The conclusion of Shellnut et al. (1999) provides indications of future research that may validate the use of the ARCS model not only to increase motivation but also to increase learning. This study examined the incorporation of the ARCS model into the instructional design of a computer-based engineering course.

ChanLin (2009) states, "interactive online learning environments encourage high student interactivity and must be supportive, open, and respectful". Best practices that encourage interactive online environments include timeliness, frequency of questioning, supportive voice tone, clear criteria, choice, and collaboration activities (p. 191-192).

Each component of the ARCS model (Attention, Relevance, Confidence and Satisfaction) can be applied to VoiceThread Instruction. VoiceThread can be leveraged as a motivational tool to enhance the virtual learning experience. Zorigian (2009) study, explored the effects of VoiceThread on student reading and achievement motivation. Brunvand & Byrd (2011) point to VoiceThread's active environment, flexibility, and ability to address multiple learning styles as motivational strengths. VoiceThread supports high levels of student engagement and motivation by providing for a strong interactive experience. Brunvand & Byrd (2011) describe to the many interactive tools fostering collaboration using VoiceThread, to include images, documents, video at their own pace. Instructors facilitate dialogue using images, videos, "powerpoint presentations with the student receiving the opportunity to share via video, voice narration, and text" (p. 31).

Keller's ARCS model, according to (Huett et al., 2008), is an "attempt to synthesize behavioral, cognitive, and affective learning theories and demonstrate that learner motivation can be influenced through external conditions such as instructional materials." As online learning continues to evolve, it is important that instruction refrain from depending on the "novelty effect of technology" to stimulate student motivation (p. 114).

## Discussion

An assumption this model imposes is addressing what motivates and what doesn't motivate. Keller (2010) suggests that "…learner motivation changes overtime and can change in unpredictable ways" (p. 271). A review of the literature regarding learner motivation reveals the need for extrinsic and intrinsic elements, self-regulated learning, a feeling of connectedness, and the use of motivational messages. According to Keller, "There is no doubt that there are serious motivational challenges among distance learners. The attrition rate alone can be viewed as an indication of motivational problems" (Keller, 1999). Some studies were cited to show that ARCS-enhanced instruction has returned inconsistent results. In addition, it was mentioned that there is little evidence that motivational factors operate independently as laid out or decomposed to only four areas (Huett et al., 2008). ChanLin ( 2009) citation of Small et al. (2004) identifies limitations of the ARCS motivational approach in web-based learning activities:

"Within the Web-based learning context, the use of motivational innovation is not only limited to the design of instruction, but also the ongoing use of communication tools and electronic resources provided along the process of learning and interaction" (p. 92).

Using the ARCS motivational design model with VoiceThread students can be engaged in new ways that stimulate curiosity, foster critical thinking, and allow students to use their voice, literally.


**Figure 1**

VoiceThread allows instructors to create content (slides, images, video, other) and upload the files as a presentation. The instructor can add voice, video, or text to engage the learner in what they are seeing. But the real value of VoiceThread is that the students can then begin a dialogue around these items (also using voice, video, or text). VoiceThread humanizes the online course by connecting the learner to the instructor, the content, and each other. Connecting the learner to the instructor provides motivation, feedback, and dialogue; with the content the learner obtains intellectual information; and through peer interaction students exchange ideas and share information (Bradley, 2009).

## Conclusion

In conclusion, the ARCS Model of Motivational Design provides for an engaging online learning platform that is highly motivating. VoiceThread has the capability to radically enhance online learning by providing students with collaborative tools to enhance feedback.

Using the ARCS model, innovations in distance education can be constructed by studying the representations and processes of motivation in online courses. Other significant approaches to research seem to be student attitudes and perceptions toward different types of media and learning effectiveness. This highlights a need for comparison studies of media used as motivational tools in regards to the types of representations available that may enhance motivation in the online environment and improve the ease of cognitive processes for particular tasks. VoiceThread's multimedia capabilities allow for instructors to embed components to best capture the attention of

participants. Keller's ARCS model provides for a meaningful learning exchange to help students become self-motivated and fosters the ability for learners to seek out deeper learning opportunities.

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# Student Satisfaction of Various Coursework Service Delivery Models: A Review of the Literature

Michelle Giles
Department of Learning Technologies
University of North Texas
United States
gilesl@stthom.edu

**Abstract:** An increasing number of colleges and universities across the United States are now transitioning their traditional face-to-face (F2F) programs into fully online distance education programs in order to maintain a competitive edge and make classes accessible to a growing population. One of the most important factors in having a marketable distance education program comes from student satisfaction (Carmel & Gold, 2007). The purpose of this literature review is to compare student satisfaction with distance education courses with equivalent courses taught in a traditional F2F format. It is anticipated that the results of this literature review will reveal that student satisfaction in distance education programs is equal to that of on campus programs. The implications of this literature review could have a direct impact for creation, development, and delivery of future and current distance education programs in universities across the country.

## Introduction

Distance education programs have been growing at a rapid pace over the past decade. According to Allen and Seaman (2011), over 6.1 million students were taking at least one online course during the fall 2010 term, an increase of 560,000 students over the previous year. Differences between these programs and traditional F2F programs have sparked many debates in the education community over the quality of these programs (Russell, 1999; Tucker, 2001). Research indicates that most of the issues regarding online delivery methods stem from factors such as course design, course interaction, course content and course support (Smart & Cappel, 2009; Tucker, 2001; Weber & Lennon, 2007).

There are a number of driving forces for the increased movement toward online distance education programs such as changes in student populations, budget constraints and competition among universities. With this rise in distance education, universities have to make sure that there is a high level of student satisfaction for distance education courses to be able to have long-term sustainability. So it is imperative that universities seek to find out what factors contribute to a higher level of student satisfaction among their student population enrolling in distance education programs.

## Literature Review

Over the years there has been an increased interest in student satisfaction in distance education courses. Many research studies have been done to help figure out what factors contribute to higher levels of student satisfaction for these programs. A majority of the literature indicates that student satisfaction is the same for both online and F2F course delivery formats. The purpose of the literature review is to investigate what is currently known about student satisfaction for online distance education programs in comparison to their counterparts taught in a traditional F2F classroom. A review of the literature will seek to uncover any gaps that would have a direct impact on future decisions for distance education programs.

Russell's (2009) "no-significant-difference" website lists hundreds of research reports, summaries and papers that investigated evidence of equivalence of distance education and traditional F2F instruction and found that there was no significant difference in student outcomes based on the mode of instruction. A study conducted by Larson and Sung (2009) comparing student performance in online versus blended versus F2F delivery modes also showed that there was no significant difference among delivery modes. The results of an exploratory study by

Powell (2007) concluded that there was no significant difference between the satisfaction levels of distance learning and on-campus students enrolled in an MPA program. According to Grandzol and Grandzol (2010), these studies established the validity of the online medium, but they offered limited insights into pedagogically sound techniques for administering online programs or designing and executing online courses.

While most of the research studies have found "no-significant-difference" for student satisfaction levels for those enrolled in courses delivered via distance education versus their counterparts delivered traditionally F2F there have been a number of studies that directly contradict the "no-significant-difference" assumption. A Finlay, Desmet and Evans (2004) study looked at students who were enrolled in online and F2F versions of the same English Composition courses to see if the no significant difference phenomenon held true. In the study, three student outcomes were looked at: satisfaction, learning, and participation in classroom discussion. The researchers found that being in an online course had a positive effect on satisfaction and participation but no effect on learning. The researchers attributed the positive effect of being in an online class to student satisfaction which is a direct contradiction to no significant difference.

Similarly, in a comparison study of student achievement and satisfaction in an online versus a traditional F2F statistics course conducted by Summers, Waigandt and Whittaker (2005) two outcome dimensions were measured: students' final grades and student satisfaction with the course. Researchers found that there was no significant difference in grades between the online and traditional F2F contexts. However, students who were enrolled in the online distance courses were significantly less satisfied with the course than those students enrolled in same F2F course. This finding is also a direct contradiction to no significant difference.

McLaren's (2004) study of five semesters of online and traditional F2F sections of a required undergraduate business statistics course, found that significantly less students persisted in online courses, but those who did had course grades comparable to their traditional counterparts. In another study using quantitative and qualitative data collection comparing student perceptions in traditional and online courses conducted by MacGregor (2001) indicated that online students reported higher workload, lower comfort levels but similar satisfaction. Issues of workload were also highlighted by Westbrook (1999).

The literature reveals several key factors are perceived as most important for student satisfaction with online courses as compared to F2F courses. These factors include interaction among students, quality and timely interaction between student and professor, consistent course design across courses, technical support, and flexibility of online courses compared to F2F (Lao & Gonzales, 2005; Northrup, 2002; Young & Norgard, 2006). Similarly, a Roach & Lemasters (2006) study found that students enrolled in an online graduate program were satisfied with the courses however they noted concerns with timely, helpful communication with the instructor; clear directions regarding course expectations, student assignments and requirements; and support for enrollment and data security. According to Lim, Kim, Chen and Ryder (2008) in an empirical investigation of student achievement and satisfaction in different learning environments, concluded that there were significant differences in student achievement among three learning groups but also found that a well-designed online course can be effective.

The literature also reveals that many of the higher student satisfaction levels for distance education programs in comparison to their traditional F2F counterparts pertain to the flexibility and ease of access that these programs afford. Most of the studies reviewed indicated that students who are prone to enrolling in online distance education courses are those who are older, working and have family responsibilities that make these programs convenient. They are seen as a viable option for them to continue their education.

## Conclusion

As student populations continue to change along with budget restrictions and competition among colleges and universities, the rise of distance education will also continue. With that in mind, universities must determine what factors will influence higher student satisfaction. Student satisfaction in online courses compared to traditional courses is markedly mixed. The research tells us that online environments support distance education learning that is equivalent to that of its counterpart; traditional F2F instruction, however it also suggests that there are unique characteristics that may yield limitations to this type of learning. Further research should examine the perceived workload of students in online courses and learning outcomes in order for more university students, faculty, and administration to confidently embrace distance education programs.

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# Gaming and its Impact on High School Students

Kashieka Popkin
Department of Learning Technologies
University of North Texas
United States
KashiekaPopkin@my.unt.edu

**Abstract:** Computer and Video Games are the topic of discussion for people of all age groups. Computer games have been used in areas of simulation in the military and other fields however the introduction of gaming in schools is slowly progressing. This paper focuses on the impact that games will have on the students enrolled in high school, and the relationship between the motivation for playing games and gender. If schools and teachers are incorporating this new technology in the learning environment it is important to determine the motivational factors surrounding gaming. A sample of 80 students from a school district in northern Texas participated in the survey. This study explores the gender differences in motivation related to gaming. In addition, the study explores whether gender is related to student preference for playing games.

## The Impact of Gaming on High School students

Some educators and parents view games as an entity that may foster violence and social isolation while others view computer or educational games in education as a powerful motivational digital environment. Computer games are being used to engage young learners and to advance science learning (Yager, 2000).

Games are engaging and fun and also promote critical thinking or problem solving skills. If educators fail to embrace the use of games in the learning environment they risk creating a gap that will only amplify the existing inequities in education (Games, Learning, Society Group, 2005/2007). Games allow players to learn through doing and creating (Gee, 2004). Learning is meaningful and reflects learner's goals and desires (Sequire, 2004). Learning is collaborative and competitive. Players solve problems and share strategies (Sequire, 2004), and players also have the ability to enact multiple identities and sets up a place or perspective from which to think and interpret (Gee, 2007).

## Potential Impact of Games and Simulation in High School Education

According to Baker (n.d.), games are a great way to solidify facts and concepts in students' minds. Using different types of games can help with building students' learning strengths. Games have the ability to cater to the needs of the visual, auditory, and kinesthetic learner. The impact that games and simulation may have on students' learning depends on what teachers do before and after their use. Games and simulation provide an environment where actions can be performed and can be thought of as intrinsically motivating. Gaming is engaged in for its own sake and not for an external tangible reward (Becta, 2001).

Games allow students to act in real roles. Games provide a safe learning environment where a missed action may not cause actual danger that might occur in a real situation. Role-play can increase students' comprehension and can be used to judge the effectiveness of actions taken and possible outcomes. Individuals learn best when given hands-on experience as they provide student engagement and authenticate the learning experience. According to Salies (2002), the benefit of gaming in the classroom includes increased memory, class performance, social benefits, and improving the transfer of learning.

## Games for learning

According to Gee (2007), all learning is, learning to play "the game." Gee further explained that there are different sorts of activities such as designing a building or literacy criticism that require different values, tools, and ways of acting and thinking. There are different gaming domains with different goals and different "win states". Games and the medium to which they are played are the focus for most high school students (Gee, 2007). Most games that are developed are designed with the intention to be promoted to and played by males. Many young girls play video games but sometimes give them up by middle school (Gee, 2007). This lack of interest in games is as a result of games being marketed to boys rather than girls. Studies conducted by Agosto (2002) and Yelland &Lloyd (2001), showed girls are interested in playing computer games. Games played and developed by females and males differ in character development, genre, color schemes for example Kafai (1996) asked girls and boys to design and implement their own video games and found that the games designed by the girls differed significantly from those designed by boys according to the use of violent feedback, characters and game genre.

Games can play major roles in the classroom, such as Sim simulations games such as SimFarm can be used in an agriculture class for building lands, buying and selling livestock. A story generation tool, Minecraft, can be used in architectural design class to teach building designs and materials, landscaping and many more. I agree with Gros (2007), that the design of a learning environment built on the educational properties of games can be an appropriate way to improve learning. Gros (2007) also provided an important point with which I agree, that gender differences influence the different lines of play or preferences but not interest in games.

In this article the writer attempts to: 1) identify if males are more motivated to use educational gaming applications than females, when both genders are given equal access to such technology, 2) identify if teachers are using educational game apps in the class, 3) identifies if students prefer to learn with this new technology in the learning environment, and 4) are students motivated to use educational games while they have free time such as at home, and at the park.

## Method

A total of 80 participants (high school students) took part in the study, of which one participant selected all possible values. Using discretion the researcher eliminated this invalid data, and hence a total of 79 high schools students participated. A sample of the student population was asked to answer questions on the instrument provided. Results showed that 13 females and 66 males participated. The research instrument (survey) was distributed electronically using Google doc, to students who were enrolled in computer science, game development and architectural design classes. The research instrument consisted of 15 categorical and true or false questions. Participants were recruited by asking permission from the high school associate principal and teachers. Participants were asked by teachers to participate by answering the survey questions. It was not mandatory for the participants to participate in the research.

## Results

General findings from the survey showed that 80% of the sample population plays games on their mobiles devices during there free time. Forty two percent (42%) of the sample population would play educational games during their free time. Eighty six percent (86%) of the sample population prefers to learn concepts in class using games. Forty one percent (41%) of the sample population agreed to like using game applications to complete assignments. Only twenty percent (23%) of the sample population plays educational games. Fifty nine percent (59%) of the sample population has teachers who used computer games or apps in class to reinforce a concept. Sixty eight percent (68%) of the sample population plays games for more than 3 hours per week. Table 1 shows the mean, mode, median, and standard deviation for the data collected.

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Gender | 79 | 1 | 2 | 1.16 | .373 |
| How many hours do you play games during the week? | 79 | 1 | 4 | 2.33 | 1.140 |
| Do you play Web Based Games? | 76 | 1 | 2 | 1.62 | .489 |
| If yes, how many hours do you spend playing web games per week. | 51 | 1 | 4 | 1.37 | .848 |
| How old are you? (age) | 78 | 14 | 18 | 15.94 | 1.073 |
| Do you play educational games? | 77 | 1 | 2 | 1.21 | .408 |
| How many hours do you spend on homework each week? | 76 | 1 | 4 | 2.68 | .898 |
| Do you prefer to learn a concept is class using games? | 78 | 1 | 2 | 1.86 | .350 |
| Have any of your teachers used computer games or computer apps in class to reinforce a concept? | 78 | 1 | 2 | 1.59 | .495 |
| When you have a free time during the day do you play games on you mobile devices? | 77 | 1 | 2 | 1.79 | .408 |
| Would you play educational games on your mobile devices during your free time? | 77 | 1 | 2 | 1.40 | .494 |
| Valid N (listwise) | 44 | | | | |

Table11: Descriptive Statistics showing statistical descriptive, mean and standard deviation.

The following null hypotheses were considered (1) there is no difference between male and female and their preference to play educational games, and (2) students would not be open to the notion of the use of computer games in the classroom if teachers use them to teach concepts.

Correlation coefficients were computed on the data sample collected, the difference by gender for students preferring to learn concepts using games is not statistically significant p=. 473, that is p>.05. It cannot be concluded that boys and girls have differing preferences to the use of games to teach concepts; hence we accept the null hypothesis. To determine if this meaningful for us to consider further the effect size was calculated using Cohen's d. This produced a value of 1.9, which implies that there might exist a very strong relationship between the two components (Cohen, 1988). Therefore this experiment might be worth repeating with a larger sample.

The relationship between gender and the number of hours spent playing games is statistically significant because p<.05, in this case p <.0005 This means that there is a significant relationship (not by chance) that gender plays a role in how many hours of game is being played per week.

There exist a statistical significant relationship between students who would play educational games on their mobile devices during their free time and when students have free time do they play games on their mobile devices, this is because p<.05, in this case p =.04, r = .23.

A statistically significant relationship exists between the students who play educational games and would they play educational games on mobile devices during their free time. That is p = .008, hence p<.05. Pearson's r = .31, indicating about 10% (.31 *.31) of willingness to play educational games on mobile devices can be explained by knowing whether or not the student currently plays educational games.

A one-way ANOVA test was conducted to determine if there exists significance between the teachers who use computer games or computer apps in class to reinforce a concept and if students prefer to learn this way and showed that $F_{(1, 75)} = 1.601$. Based on the Table B.3 in the book by Salkind (2009); the critical value for rejection of the null hypothesis at .05 level is 3.97. Since the obtained value of 1.601 is less extreme than the critical value then the null hypotheses is accepted. This shows that the difference between the groups could be as a result of chance and is not statistically significant because the p>.05 in this case p = 0.210. Cohen's d was used to calculate the effect size of .66 which signifies a moderate meaning relationship exist between the two variables. Therefore re-examination of this question with a larger sample may be warranted.

Regression analysis was conducted to identify the effect the independent variables have on the dependent variable: do students prefer to learn a concept using games. This is the major aim of this research. The strongest predictor is when students have free time would they play games on their mobile devices where p = .001, p<.05, hence it is statistically significant. The second strongest predictor is the number of hours students play games p = .003, p<.05 and is statistically significant. The effect size which is $R^2$ =.384. This suggests that 38% of the variance is whether students prefer to learn concept using games and can be explained in terms of these predictors.

## Discussion

This research is affected by internal validity as it relates to the survey designed. The survey design was flawed, the questions were mostly yes and no, instead the researcher should have designed a likert scale. Likert scale would show more differentiation in the participants' feelings. The study is affected by external validity because the classes that participated in the research were only Architecture, Game Development and Computer programming classes and would account for the high ratio of males to females. This convenience sample would not likely to be representative of all high school students.

The study showed that boys spend more time playing games than girls. Participants who play games on their mobile devices would also be interested in playing educational games on their mobile devices during their free time. The results showed that teachers use of games in the classroom to promote students to learn a concept would not be a predictor to the students preference of learning the concept, what encourages or are predictors for students preference to learn a concept using games is the ability to play the educational games on their mobile devices and the number of hours that they play games. Gender is not a sufficient factor by itself to determine if males or females would prefer to learn a concept using games as opposed to worksheets, this is in agreement with Gros (2007) who states that "gender differences influence the different lines of play or preferences but not interest in games".

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# Faculty Experiences with Online Technology Adoption: A Mixed Methods Study

Leah B. Mangrum
Department of Learning Technologies
University of North Texas
United States
leah@unt.edu

Alana S. Phillips
Department of Learning Technologies
University of North Texas
United States
AlanaPhillips@my.unt.edu

Heather Robinson
Department of Learning Technologies
University of North Texas
United States
HeatherRobinson2@my.unt.edu

**Abstract**: Online instruction advocates are emerging as the steady growth of this instruction continues. Higher education institutions are responding to the demand of online instruction by implementing advancements, such as hybrid instruction and adaptable learning environments in an effort to provide students with exceptional online education. The purpose of this study is to explore how technology adoption in these environments influences faculty experiences, interaction, preparation, and training. The study gathers information on faculty experiences with online learning technology and explores the way the courses are delivered and the satisfaction with the tools of the course. This paper will detail the mixed method processes, methodology, and findings of research which aims to define factors that inform the types of tools instructors use in online courses.

## Introduction

The intent of this mixed methods study is to examine the impact of technology adoption upon faculty experiences with online learning. The researchers aim to define factors that inform the types of tools instructors use in online courses and gather information on faculty experiences with online learning technology that influence: (a) the way the course is delivered, (b) the satisfaction with the course or tools of the course, and (c) facilitating communication, feedback, and interaction. The information produced from this study may be used to help other instructors design their courses to increase interaction and provide instructors with options as they are deciding the online learning technologies to adopt. Research questions used to explore faculty experiences with technology adoption regarding interaction, preparation and training in online learning: include: How does technology adoption influence faculty teaching experiences in online learning? How does technology influence interaction in online learning? How does technology training influence faculty?

## Methods

This study used a mixed methods explanatory sequential design. This three-phase, triangulated, explanatory study first obtained statistical demographic information and second, statistical quantitative results from

a sample of online instructors at a public university in a small metropolitan area in Texas. A third, qualitative phase conducted as a follow up to the quantitative results helped explain and explore the results from the demographic and survey results; three randomly-selected faculty members who responded to the initial survey were interviewed in the attempt to bridge the demographic and survey results.

## Results

### Part 1: Survey

Six males and five females contributed responses to the study (*N*=11). The age of the participants ranges from 36 to 67, with an average age of 45.8. Seventy-three percent of the participants reported receiving a doctorate degree as the highest degree received. The faculty rank of the participants include: one Full-professor, two Associate professors, one Assistant professor, one Instructor/lecturer, and six others (Adjunct or Teaching Fellow). The participants teach Bachelor, Master, and Doctoral online courses. Ninety-one percent of the participants have been a student in an online course. An online course is defined in the survey as those delivered using web technologies with no face-to-face or on-campus class meetings. Forty-five percent have been teaching online courses for six or more years, 27% for four to six years, 9% for one to three years, and 18% for less than one year.

### Part 2: Instrument

Participants were asked which LMS they currently use from a selection of Moodle, Blackboard, Schoology, Desire2Learn, Canvas and Other. Sixty-four percent of participants use Blackboard, 55% use Moodle, 27% use Schoology, 9% use Canvas. The online faculty that participated in the survey use a variety of tools to conduct synchronous class discussions. The participant's indicated the synchronous tools currently used in their online classes: 73% use Adobe Connect, 64% use Google Docs and Skype, 27% use iChat, 18% use Blackboard Collaboration, GoToMeeting and other tools not listed in the survey. Less than 10% use Big Blue Button and WebEX. Although 55% of participants use Blackboard as the LMS to deliver their online courses, only 18% use the Blackboard Collaborate tool for synchronous online sessions. Participants reported feeling comfortable with the following tools: Moodle, Blackboard, Schoology, Desire2Learn, Canvas, Adobe Connect, Google Docs, Skype, iChat, Big Blue Button, Wimba Classroom, and GoToMeeting. However, results of the survey instrument indicate that faculty are most comfortable with Moodle and Skype. The participants are predominantly self-taught using these tools, with 1-2 hours of formal training using Blackboard, Schoology, Canvas and Adobe Connect, 3-5 hours of training using Moodle, Blackboard and Wimba Classroom, 6-8 hours using Blackboard and Canvas, and 10+ hours of training using Moodle, Blackboard and Big Blue Button. Seventy-three percent of participants spend 3-6 hours preparing for one of their online classes.

Sixty-four percent of participants reported experiencing a moderate level of interaction with and among students in their online courses. Twenty-seven percent experience high levels of interaction and 9% experience low levels of interaction.

### Part 3: Interviews

Ten interview questions are intended to explore factors of technology adoption on faculty experiences with online learning, visualizations are used to see patterns in coding and to describe evidence for selected themes.

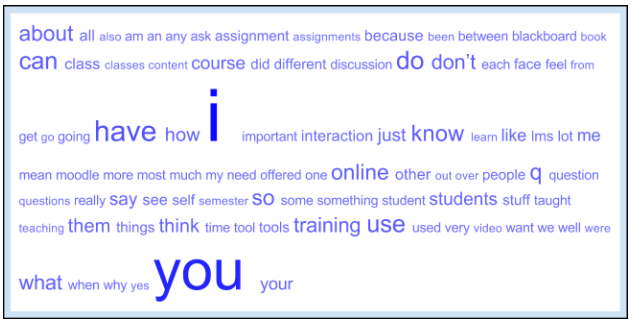


Figure 1. Tag Cloud: Word frequency of words used in interview responses

A Word Frequency illustration helped to identify potential themes. The words "training" and "interaction" are frequently used in each of the interviews. Most frequently used words are displayed alphabetically and the larger words were used the most often. A tree map was used to visualize codes identified in the study by color and size; the larger boxes contain the most references from the interviews. From group coding, there were eight references to communication from the three interviews. Coding resulted in five references to control in the online environment, and four references to participation. Grouping the codes together resulted in categories of emergent themes of Interaction, Environment and Training. There were 14 references to Environment within the three interviews, Interaction contained eight instances and Training contained seven.

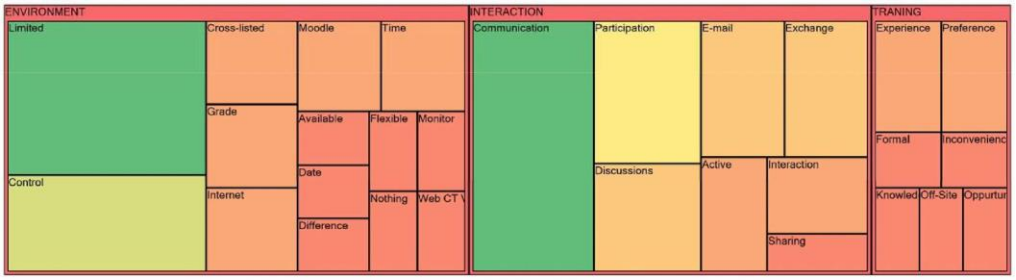


Figure 2. Themes compared by number of references coded

When asked if they had been offered any training for teaching in the online environment, one participant found training to be available but limited. Another participant found formal training to be available but not convenient and one participant felt there was no formal training available and preferred to be self-taught. Each participant stated that the Learning Management System used for their online courses is selected by the University; therefore they have no choice in what LMS is used to deliver their courses. One participant explained that formal training for teaching in the online environment is offered at his/her institution but is limited and therefore less effective for those with a great deal of experience teaching online courses. When asked what features of the LMS they considered most important to their teaching experience, one participant explained that there are several tools (forum, chat, gradebook) available within the LMS. Another participant utilizes email and discussion threads and one participant uses discussion boards, dropboxes, surveys and activities.

Faculty want to learn multiple technologies to stay abreast of advancements in technology but does not always use new technologies in instruction because formal training is limited and offerings of technology are controlled. Faculty references hearing of additional tools and technologies that sound interesting, but doesn't seek training because of prior experiences with face to face training. Faculty also feels that formal training is not offered and prefers self-training.

Faculty member's responses to needing more training now: "Well, more training from my school – I don't think so, More training to see new technologies –yea of course. Like I said everyday there are new technologies out there so you need to keep constant training on everything so definitely. I'm trying to learn new things everyday and everyday new tools come and appear and things like that so definitely, you need to keep up dated all the time." "I wouldn't mind it because there are some things that I know I don't use or I don't use well. I know in Moodle the grade book continues to stumble me because I'll have, you know not every semester, I change up assignments, but whenever I've tried to eliminate entries in the grade book, especially if it's in the middle of the semester, I end up totally corrupting the grade book, so I think there are different elements of Moodle that I would like to understand

more. So, yes I could definitely use some more training or some more self training." "Yes, I probably do. I would like to know about using a few more of the features or maybe in-depth on the features I do use. It is kind of difficult because I don't know what I am missing. I will hear people chat and wonder how to do that and then I will inquire about how to do it."

Data in all phases was analyzed using Qualtrics, NVivo, SPSS and Excel to search for answers to the research questions and ensure validity of qualitative data. A connected analysis procedure describes the results of the survey and interview to interpret the data in a side-by-side comparison of emergent themes. Comparisons of the content from the demographic survey, quantitative data, and qualitative semi-structured interviews attempt to demonstrate triangulation.

## Conclusions and Implications

There is a demand for faculty members to teach online courses (Sammons & Ruth, 2007; Lloyd et al, 2012). Universities and institutions have expectations of their faculty members to transition into online instruction, regardless of their faculty ranking (Akdemir, 2008), but the support, training, and use of standards may not be adequate. This study involved a small concentrated focus of participants, eleven surveyed and three interviewed. Interviewed participants were all from a technology-based discipline. Interviewed participants were all positive about online instruction.

The number of participants who were interviewed is a limitation of this study. Three faculty members were selected for interview, while all were positive about their online teaching experiences, this may not be indicative of the general population of online instructors. Additionally, the participants were online instructors in a technology-based discipline, which is not representative of all online instructors. According to Porter (2011), online instructors can be well versed to having minimal technology experience, depending on their discipline. One interview participant stated that faculty in this department are "highly skilled" in technology. Instructors who participated in this study are utilizing multiple tools within the LMS they use. Several studies suggest the use of a training program or faculty development that is more informal and is led by faculty members with prior experience within the LMS (Porter, 2011; Hiser, 2008). New faculty have varying degrees of experience with technology (Porter, 2011). A convenient online training program similar to an online course (Hiser, 2008), which focuses on a specific portion of the LMS for a deeper focus is something missing from the current training options. Forming a community as a whole for all disciplines of online instructors for the institution may be beneficial. This would allow for an interactive and convenient outlet for faculty members to learn and share experiences. As there are many types of online learning issues, future research should focus on the following:

1. A larger, more representative population
2. Examinations of self-taught instructors and formally trained instructors.
3. Evaluation of administrative experiences.

As we continue to move into the Fifth Generation of Distance Education, it is becoming increasingly important to include web-based learning at the university level as well as find ways to implement instructional design that includes new media technologies (Taylor, 2001).

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# Teacher-created Class Websites: A Proposed Taxonomy

Lemoyne S. Dunn, Ph.D.
Department of Learning Technologies
University of North Texas
United States
Lemoyne.Dunn@gmail.com

**Abstract**: For years, teachers have been encouraged or required to post class websites. Yet, many of these websites are nothing more than online newsletters. Students today are electronically "connected" and expect their learning to be "connected" as well. One easy way to incorporate technology to extend learning is through their class website.

## Where Is Education?

As is often the case, the K-20 educational system is not evolving fast enough to keep up with technological changes. Students today are electronically "connected" and expect their learning to be "connected" as well. Many college students prefer online classes, even if they live on campus. Those students who do take face-to-face classes expect a communication component (such as a discussion board) as a part of the class. Universities are integrating many online systems and technologies into their curriculum. However, despite the fact that K-12 teachers have easy access to technologies to prepare students for this style of learning, many often fail to utilize them. One easy way to incorporate technology to extend learning is through their class website.

For years, teachers have been encouraged or required to post class websites. Yet, many of these websites are nothing more than online newsletters. Even the majority of the websites of the faculty at the School for the Talented and Gifted (TAG Magnet) in Dallas ISD, rated the best high school in the nation in 2006, 2007 and 2009 (Newsweek, accessed 2009), fail to utilize their teacher websites to their fullest potential (Dallas ISD Faculty Pages, accessed 2009). While somewhat valuable, these "newsletter" websites could be made much more effective when integrated into the curriculum and modified to include two-way communication.

## The Purpose of a Class Website

The first thing to consider when building a class website is the audience and purpose of the website. According to Dunn and Peet (2010), a class website can serve one or more of the following purposes:

1. disseminating static information such as a short biography and photo of the teacher, the class schedule and syllabus, a list of class rules and expectations, etc.
2. disseminating semi-static information such as school events and competitions, class news and events, schedule changes, student work, and awards or recognitions.
3. disseminating additional curricular and non-curricular resources such as handouts, worksheets, and links to other websites.
4. acting as an integral part of the curriculum by providing a repository for information from multiple sources and a location for continuous multi-directional interactions between any educational stakeholder.
5. acting as a dynamic and growing knowledge repository for the course.

These purposes form the basis of the taxonomy shown in Appendix 1.

## Components of Websites

**Level 1 – Static**

The purpose of a Level 1 (Static) site is solely the dissemination of non-changing information such as that which might be sent home in the form of first-day-of-school notes. A Level 1 website most often contains items such as the teacher's name and contact information, the class rules and expectations, the syllabus, the class schedule, and other notes to parents. Level 1 websites contain primarily logistical information and nothing other than possibly a syllabus that could strictly be considered "curriculum-related." This level of website is generally updated only at the beginning of the school year. Many districts began having teacher websites by requiring their teachers to create such sites with only the static information such as that listed above. Although part of an extensive and complex educational website, the web page located at http://www.mrsrenz.net/mrsrenz.htm is an example of a good Level 1 site.

**Level 2 – Semi-Static**

The purpose of a Level 2 (Semi-Static) site is the dissemination of information that changes periodically. Level 2 sites generally contain static information found in Level 1 sties, plus such things as announcements of upcoming school events, schedule changes, results of academic and non-academic student competitions(e.g. UIL and sports scores, respectively), other class news, photos of past events, and awards or recognitions. These sites are generally updated only based on the occurrence of an event. An example of a Level 2 website highlighting student work can be found at http://www.kdoerge.com/studentart.html. The students' art work can actually be purchased at http://www.cafepress.com/gatewayart.

Lower-level websites such as Level 1 (Static) and Level 2 (Semi-Static) websites are defined by the fact that they include only non-curriculum content and one-way (teacher to parent/student) communication. No activity other than reading the site is possible for the student or other educational stakeholders. While valuable to building classroom community and keeping the parents and students informed, Level 1 and Level 2 sites do nothing to enhance learning.

**Level 3 – Supplemental Resource**

While Level 3 (Supplemental Resource) sites still offer only one-way communication between teacher and student/parent, they differ from Levels 1 and 2 because a major purpose of a Level 3 site is the dissemination of additional curriculum-related materials and resources. These sites often contain most of the Level 1 and Level 2 information, but also feature links to both teacher-created resources (e.g. study guides, outlines, etc.), and other-created resources that may be related to the curriculum (e.g. games, puzzles, the textbook site, embedded videos, and course-related professional links such as NASA, USGS, etc.). Students and others may access the additional resources on a Level 3 site for more information or activities. A Level 3 site is generally updated every 2 – 6 weeks, whenever new resources are created or found, or when existing links cease to function. Student use at this level may be optional, encouraged, or occasionally, required. These sites may be referred to occasionally during class. An example of a simple Level 3 website using a blog with a 3rd-grade class can be found at http://yollisclassblog.blogspot.com/. Also, if instead of a blog the instructor used a wiki on which the students could respond to curricular questions directly, this would then be considered a Level 4 website. An example of a Level 3 site for older students can be found at http://www.kdoerge.com/natureofscience.html.

**Level 4 – Integral Curricular**

Although not much harder to produce, teacher-created Level 4 Integral Curricular websites are still fairly uncommon but are growing in number. This higher-level website may or may not include information from the lower three levels. Regardless, the major focus is on the curriculum and student learning with the website acting as an integral part of the curriculum by providing a repository for information from multiple sources and a location for continuous multi-directional interactions between a variety of educational stakeholders. The information on these sites is considered integral to the curriculum and student interaction is expected and required. These sites are generally updated at least weekly (usually much more often), and are typically moderated on a daily basis. Two-way communication related to the curricular material is what gives these sites their educational value. Teachers often post a higher-order curriculum-related question and students are required to post a response. Often teachers will require students to respond to other students' postings, as well. These posting can develop into deep discussions, far

past what time in the classroom would allow and often act as formative assessments. Students may, of course, post questions of their own. Student questions, often answered by other students, can occasionally demonstrate areas of misconceptions that might not otherwise be discovered by the instructor. Blogs, wikis, and discussion boards are the most common communication components used. Many of these websites are password protected and available only to students in those classes.

**Level 5 – Pedagogical Memory**

These websites are similar to Level 4 sites, but differ in the fact that a Level 5 website uses input from the students to inform and change the curriculum. The purpose of a Level 5 site is to act as a dynamic and growing knowledge repository for the course. This level is a truly interactive learning experience and often involves student research. These sites demonstrate preservation of prior work that is used as a springboard for future work. Student-generated methodological and/or content additions, deletions, corrections, or enhancements add to the body of knowledge in the course and students work collaboratively to solve problems requiring higher-level thinking. Changes often strengthen the pedagogy of the site for future use. These sites are updated and maintained almost daily. While there are some, few Level 5 websites exist yet. Possible factors limiting the number of Level 5 sites include the amount of time required from the teacher, the lack of one-to-one access for students in many schools, and the general lack of student input into the curriculum whether or not technology is involved. The use of this type of pedagogy will take time to develop.

The higher-level websites can replicate and extend higher-order classroom activities such as discussions, problem-solving activities, and extended projects that limited classroom time often does not allow. Lower-order activities, such as turning in homework assignments, can be facilitated, as well, allowing the teacher access to student work wherever the teacher is. Higher-level sites also allow access for students who may be out of class because they are temporarily homebound do to an extended illness or traveling with family. While examples of Level 5 sites exist, most are password-protected and available to only students in those classes and their parents.

## Getting Started

Many people believe that the hardest part is building the website. Website construction and maintenance is easy today because of many free and easy-to-use software platforms. Programs like Moodle® are used by many teachers to create their own online class components, which is what Level 4 and 5 websites really are. Wikispaces (and other similar blog sites) are also free and easy to use. District technology personnel should be available to assist in the technological issues of setting up such a site and will know what is available in the district environment. Otherwise, the sites themselves are generally instructional enough, even for a beginner and can be located with a simple Google search.

The first step in getting started is to decide what is needed to make an "effective site" so valuable teacher time is not wasted. Effective sites are not defined so much by their components, but as to whether the components are being used effectively to meet the educational needs of the students. Is the educational purpose to increase in-depth discussion time, encourage problem-solving, deliver additional resources, act as a platform for turning in assignments, or some combination of these and other purposes? Are the students advanced and need enrichment opportunities or do they need remediation? Can online discussions serve as a good opportunity to encourage ELL (English Language Learners) students more time to formulate their thoughts in order to participate more fully in discussions? It is actually the educational needs that will define the best components of an effective website. Each teacher must consider the needs of their own students when designing a class website.

Additional factors will have to be considered when designing a website that will be an integral part of the curriculum:

**The time required by the teacher to maintain the site**

Levels 4 and 5, to be used to their fullest potential, require very regular monitoring and updating in order to be most effective. However, much of this time can be recouped by replacing existing classroom activities with Internet-based ones.

**Student access**

As Internet access becomes more ubiquitous, this becomes less of an issue. However, student access must be considered if interaction with the website is a required part of the curriculum.

**Teachers' readiness for such a paradigm shift**

The value of using Level 4 and 5 websites will depend on the teacher's quality and abilities. Training and administrative support is needed to encourage teachers to develop and effectively use level 4 and 5 websites with their classes.

Once you have thought this all through, approach your district or campus technology person for help developing your ideas for a higher-level class website.

## Conclusion

As with any pedagogical change, without demonstrating the value of Level 4 and 5 websites to the teachers, resistance will be great. However, a few innovative teachers have seen the value and begun using these types of websites by integrating blogs, discussion boards, and other forms of bi-directional communication as regular course activities. These teachers can act as models, mentors, and presenters to encourage other teachers to move forward.

While using higher-level websites at the K-12 level is valuable for extended learning past the school day, they can be seen as support for life-long learning, as well. Blended learning environments are becoming more prolific at the post-secondary level daily. There are a growing number of degrees and certifications now available only through distance learning. Corporations are using distance delivery for professional development. K-12 educators are doing their students a disservice if they do not prepare them properly for future learning environments.

It is imperative that we think outside of the box, watch the students, and learn from them how society and thinking processes are changing. Only in this way can we best serve our students.

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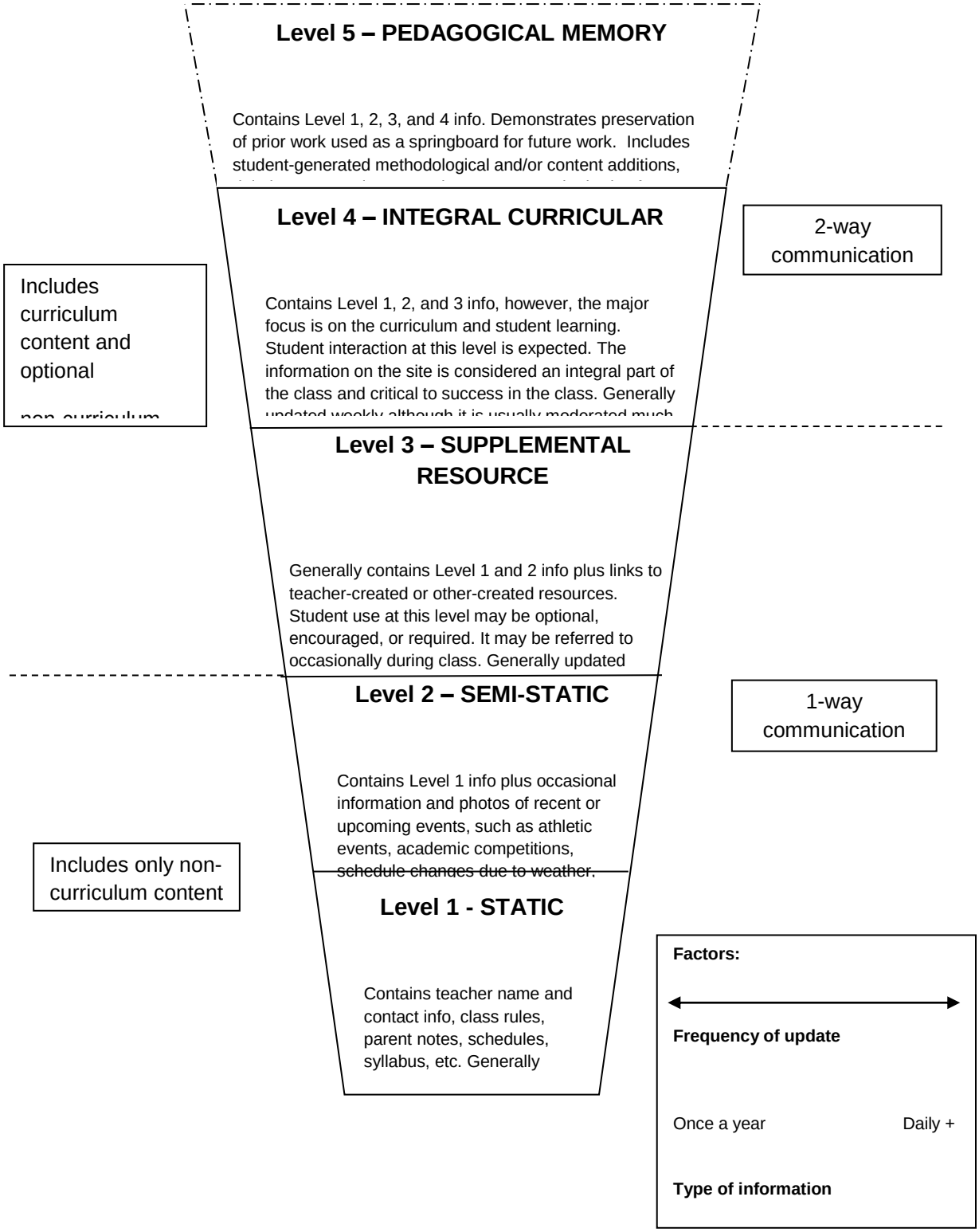
## Appendix 1


Level 5 – PEDAGOGICAL MEMORY
Contains Level 1, 2, 3, and 4 info. Demonstrates preservation of prior work used as a springboard for future work. Includes student-generated methodological and/or content additions,
Level 4 – INTEGRAL CURRICULAR
2-way communication
Includes curriculum content and optional
Contains Level 1, 2, and 3 info, however, the major focus is on the curriculum and student learning. Student interaction at this level is expected. The information on the site is considered an integral part of the class and critical to success in the class. Generally
Level 3 – SUPPLEMENTAL RESOURCE
Generally contains Level 1 and 2 info plus links to teacher-created or other-created resources. Student use at this level may be optional, encouraged, or required. It may be referred to occasionally during class. Generally updated
Level 2 – SEMI-STATIC
1-way communication
Contains Level 1 info plus occasional information and photos of recent or upcoming events, such as athletic events, academic competitions, schedule changes due to weather.
Includes only non-curriculum content
Level 1 - STATIC
Contains teacher name and contact info, class rules, parent notes, schedules, syllabus, etc. Generally
Factors:
Frequency of update
Once a year
Daily +
Type of information

# A Framework for Considering Education: Three Pillars of Cognition and Four Types of Learning

S. Willard Elieson
University of North Texas
Bill.Elieson@unt.edu

**Abstract:** Concepts are most useful when they are well defined, and when those definitions are supplemented by examples. In this paper, several concepts that relate to cognitive learning are defined and discussed, and enriched by examples. These concepts include the Three Pillars of Cognition, Exogenous Learning, Endogenous Learning, Independent Learning, and Collaborative Learning. By understanding these concepts well, one should be more able to effectively plan and evaluate learning activities.

## Introduction

When we give names to concepts, it is easier to think and converse about them. And when we enrich those names with definitions, examples, and counter-examples, it becomes even easier to use the concepts usefully.

In this paper, I discuss a handful of concepts that have to do with learning. Some of these concepts will be familiar to the reader, while others are defined here for the first time. One objective of this paper is to further our understanding of how learning occurs in different settings. A second objective is to appreciate that a consideration of these concepts can help in both the planning and evaluation of learning activities.

## The Three Pillars of Cognition

How does learning occur? It is proposed here that, in general, learning occurs only when all Three Pillars of Cognition are present, and learning does not occur if any are missing.

The first pillar is *attention*. If a person is not paying attention to something, they cannot learn from it. One implication is that the more minutes of effective time-on-task, the greater should be the resulting learning. The challenge is to design and provide learning experiences that make it easier for people to pay attention, and to do so more often and for longer periods of time.

The personality of the presenter, a comfortable environment, the motivation of the learner, the health of the learner, and the nature of the learning materials are among the factors that can influence the attention of the learner.

The second pillar is *association*. I sometimes refer to this pillar as construction, but I do not intend to get into the complex theories of constructivism here. Rather, I simply assert that one cannot learn something new without having first obtained certain prerequisite knowledge. And when we do learn something new, it becomes associated with or "attached" to something we already know. Hence the concept that knowledge is constructed item by item, each piece building on something that is already there. Here are some examples to illustrate this.

- Understanding numbers and addition is a pre-requisite to learning multiplication.
- Understanding the concept of IF-THEN is a pre-requisite to writing a computer program.
- Understanding Spanish is a pre-requisite to understanding a lecture delivered in Spanish.

One implication is that in planning a learning experience, one should identify the necessary pre-requisites and ensure that they have already been obtained by the learner. And then the new material should be reasonably related to that existing knowledge.

Another implication is that the student who enters a new course with the most knowledge will probably be the person who learns the most during the course. This is because that person has the most "hooks" to which new knowledge can be attached.

There are a few exceptions to this principle of association. Some things must be learned by brute force without being associated with any prior knowledge. For example a child has to memorize the letters of the alphabet and how to count without already knowing something to which this new knowledge can be related.

The third pillar is *reflection*. Admittedly, this is not a requirement for lower-order learning, but it is a requirement for higher-order learning and performance. This refers to the process of pondering things that are already in your memory, mentally searching for relationships, meanings, and deeper understanding.

## Exogenous Learning

In Bloom's Taxonomy (Revised), the three lowest levels are called *remembering*, *understanding*, and *applying* (Anderson & Krathwohl, 2001). For example, a teacher might elicit a response reflecting these three levels, respectively, by asking:

- Remembering: What is the formula for the Pythagorean Theorem?
- Understanding: What is the meaning of the Pythagorean Theorem?
- Applying: If I tell you that the length of one side of a right triangle is 3 and the length of the hypotenuse is 5, what is the length of the other side?

These three levels describe intellectual activities that depend on the prior acquisition of specific knowledge. Their application does not require much more than this prior acquisition. Therefore, a student with a good memory can do well in a curriculum that does not require intellectual activity at levels higher than this.

Because the successful use of this knowledge does not usually require reflection, I find it convenient to refer to it as *exogenous* knowledge – knowledge that comes to the learner from outside his or her own head.

It might be acquired by listening to a lecture, reading a book, watching a video, or through any other medium. But it can be a relatively passive activity, mentally.

## Endogenous Learning

In contrast, performing at the higher levels of the Taxonomy – *analyzing*, *evaluating*, and *creating* does not necessarily depend on the acquisition of additional knowledge or understanding from outside. Rather, mental activity at these levels depends on what goes on inside the head of the person, based on the knowledge that is already there. For illustration, here are three tasks, each reflecting the need to perform at one of these higher levels:

- Analyzing: Study the last State of the Union address and identify the topics discussed.
- Evaluating: Write a review of tonight's performance of Swan Lake.
- Creating: Design a landscape plan for your next-door neighbor's yard.

As a person wrestles with how to utilize their knowledge in order to perform a higher-order task, new knowledge and understanding might be created in the mind of the person. If so, it can be characterized as *endogenous* knowledge – knowledge that is generated inside the learner's own head.

That is not to say that one cannot search for additional exogenous knowledge in order to better understand a problem and perform a task. But this search for additional knowledge is dependent on the task and the person; it is not a universal pre-requisite for performing a higher-level task.

And note that endogenous knowledge can be created as one acquires exogenous knowledge. For example, while reading a textbook, one can reflect on some idea that is being presented, relate it to other things already learned, and generate insights and understanding that are not manifest in the book itself.

I have observed the presence in our society of notable men and women who did not excel in school. That is, they were not exceptional learners of exogenous knowledge. But they are magnificent at developing endogenous knowledge and understanding that serve society in various ways.

Note the correspondence between the 3rd Pillar of Cognition, *reflection*, and the generation of *endogenous* learning.

## Independent learning

Not everyone agrees on what this term means. Some use it to refer only to self-directed learning.

Some say that independent learning is what independent learners do, and they describe the characteristics of those students most likely to succeed as independent learners. This shifts the emphasis from the characteristics of the procedure to those of the learner.

Here, I will use this term to describe learning activities where one is not interacting with, and is not receiving active guidance from, another person. It does not matter if the learning is self-directed or in response to an assignment.

A notable example of institutional sponsorship of independent learning is Western Governors University (WGU). WGU was created in 1997 by the joint efforts of the governors of 19 western U.S. states. After an understandably slow start (there were no students for 2 years, and then it took several more years before there were more than a few hundred students enrolled), WGU now has almost 40,000 students and has been growing at a compound rate of more than 30% per year.

Practically speaking, WGU does not have a teaching faculty. It has some subject matter experts who are available for coaching on demand. But essentially all of what a student learns is by independent learning, as I use the term here.

How does that work? In each course, a student is provided appropriate and sufficient learning resources, such as textbooks. They are told the competencies they are to acquire in the course, and they are told the form of the evaluations – standardized exams, essays, etc. – that will be used to demonstrate their acquisition of those competencies. As soon as they demonstrate each of those competencies in the prescribed manner, they receive credit for the course and move on to the next one. Seat time and calendar time are not relevant at WGU, only the satisfactory demonstration of competencies.

WGU students are also assigned to a mentor with whom they have contact every week or two. The mentor is to guide and nurture them through the acquisition and demonstration of the course competencies. But the mentor does essentially no subject matter coaching.

As suggested above, it they get stuck on some point and cannot get past it, they might be referred to a subject matter expert who will assist them. But this is an infrequent occurrence.

Incidentally, this competency-based, independent learning model of education seems to be working well for many, if not all, WGU students. Surveys of employers say that WGU graduates are as able and as well regarded as those from more traditional universities. But WGU has found, and common sense tells us, that some types of students will do better in that structure than others.

## Collaborative learning

This is another term to which different people have attached different conditions and meaning. Here, I use the term to refer to any situation where a learner interacts with another person. That other person might be another learner or it might be a teacher or mentor. The point is that the learner is no longer an independent learner.

I call attention to two distinct motivations for collaborative learning. One is based on the temperament or personality of the learner. The other is based on the nature and benefits of the collaboration.

### Temperament

Jung (1971) and Myers and Briggs (Myers, 1980), among others, have identified a major feature of human personality as being the degree to which one is an introvert or an extrovert.

Introverts are comfortable working alone. They prefer to work things out in their own mind before expressing their opinions to others. They make good independent learners and are likely to succeed at WGU.

Extroverts like to interact with others. They enjoy the social interaction, regardless of any intellectual enrichment that might come from it. They are more likely than introverts to express half-baked ideas just for the sake of having a conversation. They are more likely to speak up in classroom discussions and public meetings.

Extroverts are less likely than introverts to persist and succeed in an independent learning environment, such as WGU. They prefer an environment where they interact with others, such as a traditional classroom. In other words, they welcome collaborative earning because of the social interaction inherent in it,

**Cognitive Benefits of Collaboration**

Vygotsky (1978) is known for proposing a concept called the zone of proximal development (ZPD). This refers to the difference between what a person can learn as an independent learner and what they can learn with the assistance of another person. It is generally accepted that the ZPD is real. The question is, how do we take advantage of it in developing a learning experience?

This opens the door to a consideration of all the studies that deal with the potential benefits of teams, with the potential benefits of collaborative learning, with the subject of mentoring, etc. I will briefly summarize what I believe those studies, and our common experiences, show.

- A wise mentor can assist a mentee in several ways. One is by asking questions that direct the learner's attention to something he or she might not have noticed or thought of before. This can stimulate endogenous learning.
- A mentor can also provide exogenous learning that the mentee is ready to make use of.
- Properly constructed and led, a partnership or group can develop better ideas and outcomes than can any individual in that team who works alone. This occurs because the (exogenous) ideas expressed by one person can stimulate the (endogenous) ideas of another person in a way that would not have otherwise occurred. As those ideas are discussed back and forth (by extroverts and introverts), better understanding and outcomes are generated.

## Summary

For learning to occur, the Three Pillars of Cognition must be present. The learner must be paying attention to the learning resource, in whatever form it is provided. The new material must relate to and build upon something the learner already knows. And for deep, higher order learning and performance, the learner must spend time alone, pondering the knowledge and understanding that have been acquired so far.

It is useful to understand that some knowledge, referred here to as exogenous knowledge, comes to the learner from various outside materials. And some knowledge, referred to here as endogenous knowledge, is a result that comes only from the independent activities of pondering and reflection. Exogenous knowledge is primarily associated with lower-order learning, and endogenous knowledge with higher-order learning and performance.

As important as is independent learning, it can be augmented by appropriate collaborative learning. The interaction with others can help the learner bridge the ZPD gap.

Collaborative learning is useful both for the social interactions favored by extroverts, and for the cognitive insights that come to both introverts and extroverts as a result of those interactions.

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# Threaded Cognition: A Lens to Better Understand Multitasking Behavior

Josh Gordesky
Department of Learning Technologies
University of North Texas
United States
joshuagordesky@my.unt.edu

Michael Marmon
Department of Learning Technologies
University of North Texas
United States
michaelmarmon@my.unt.edu

**Abstract**: A student's ability to multitask while completing assignments is perceived to be a valuable skill for academic success. Multitasking is defined as the process for "how people integrate and perform multiple tasks in the context of a larger complex task" (Salvucci, 2005 P. 458)**.** In terms of completing assignments, many students find ways to distract themselves with different forms of media and communication resources, while trying to engage themselves in critical thinking activities. Such distractions include having the television on in the background, while working on a laptop that has two windows open -- each with tabs open to various websites unrelated to the assignment. In addition, smartphones are usually close by the student's laptop in order to respond to text messages, tweets, and Facebook posts from family and friends.
This paper will introduce the theory of threaded cognition, which was first proposed by Salvucci and Taatgen (2008), as a method for "understanding, modeling, and predicting performance" during the cognitive process of multitasking (P. 101). The theory of threaded cognition will serve as the foundation for understanding why these self-imposed distractions negate the ability to analyze or comprehend information on a deep, reflective level. In addition, the paper will recommend effective study habits for students to follow given the realities of the temptation to divert their undivided attention to an ever-increasing number of social media platforms while simultaneously attempting to complete an academic assignment.

## Introduction

Multitasking while working or completing a school assignment has become an extremely common occurrence. Students see each other doing these combined activities and see nothing wrong with it. Just ask any college student if he or she usually has a television set or an MP3 player on, while also attending to the incoming posts on their Facebook pages, along with having numerous hobby-related internet websites open at the same time they are attempting to read a textbook chapter to answer comprehension questions, and the answer would most likely be "yes." In addition, there's good reason for students to believe that combining all of these activities is a good thing, as Salvucci and Taatgen (2008) noted that this ability "to manage and execute multiple concurrent tasks" comprises one of the "most impressive aspects of the human cognitive system" (P. 101). Students feel like they are working smarter, not harder, by seemingly maximizing their time and pushing as much information into their minds as possible.

However, the cognitive load theory states that working memory is limited in its ability to process information. Given the reality of a limited amount of cognitive resources, then a logical question becomes, "Does multitasking, in terms of directing attention to visual, audio, and kinesthetic resources at the same time while also attempting to use those exact resources to engage the mind in deep, reflective thought, help or hurt the ability to complete academic assignments?" The answer, which is based on the theory of threaded cognition, is "no".

## Threaded Cognition

The theory of threaded cognition seeks to explain performance through the use of "cognitive resources that can operate in parallel" with the caveat that "only a single resource can be used for a single task at a time" (Taatgen et al., 2009). For example, a student would be overloading the visual channel by attempting to process a "thread" of characters as seen in a text message on an iPhone, while also typing thoughts into a term paper on a laptop.

The result of this jamming of two threads into the same place, which would be to create an overloaded visual channel, would be something negative. For instance, there would likely be a longer than usual amount of time to type a particular thought accurately in the term paper. Even worse, the student would probably end up typing the content of the text message into the term paper because of the temporary confusion due to the overloaded status. The theory of threaded cognition also requires that each subsequent act occur in a dominant manner, which will end up consuming all resources until it is no longer needed (Taatgen et al., 2009). This means that in the same way that driving a car on a quarter tank of gas to five distant places instead of one location will cause the car to run out of gas before reaching the final destination, the student will run out of cognitive resources to complete the academic assignment if attention is continually divided among similar activities that are processed in the same mental channels.

## Net Generation and Multitasking

In today's multimedia-driven world, a lot of importance has been placed on the activity of multitasking, particularly in the sector of education, as well as in defined sections of the population. For instance, according to Junco (2012) the "Net Generation", also known as digital natives, is unique because that generation of students has only known a world where "information and communication technologies (ICTs) are a part of daily life." Carrier et al. (2009) takes this unique gift of the generation one step further than Junco by indicating that members of that generation often engage in multitasking activities as a "way of life."

Additionally, there's an acceptance of those people who can seemingly multitask -- even an admiration -- since that perceived skill indicates one's ability to "enhance the efficiency and effectiveness of how they work and manage their daily lives" (Judd, 2013). The example usually cited of this efficiency and effectiveness is again the Net Generation. It has been said that their familiarity with technology allows for multitasking activities such as their ability to simultaneously "text, surf the Internet, chat on a mobile phone, while (ostensibly) studying" (Harding, 2010). One has to wonder how this actually possible. Gasser and Palfrey (2009) expand on the concept of multitasking by explaining that multitasking is essentially "parallel processing" where numerous activities occur at "exactly the same time" (P. 17).

However, as the theory of threaded cognition shows in terms of the results of multitasking, there's a tremendous difference between (1) being able to do something and (2) being able to do that activity well. For example, Adler and Benbunan-Fich (2012) assert that parallel processing is "difficult to achieve effectively as human attention cannot be simultaneously divided among many tasks." Yet, it's important to distinguish between different types of multitasking. For instance, a person can walk and chew gum because the utilized "motor skills do not overlap too heavily with those that interpret visual cues, control language, or run other complex processes" (Telis, 2010). However, that same person would have a difficult time simultaneously engaging in "parallel processing" of verbal information by holding two different conversations -- regardless of the topics -- because the same cognitive channels are being used at the same time.

The concept of parallel processing is interesting as it explains "why some tasks interfere with each other and some do not: the more overlap in cognitive constructs between tasks, the more interference" (Borst, Taatgen and van Rijn, 2010 P. 363). The theory of threaded cognition further refines the concept by explaining that multitasking is possible and effective "as long as there is no overlap in the cognitive resources needed by these threads (i.e. goals) then there is no multitasking interference" (Salvucci and Taatgen, 2011 P. 228).

## Conclusion

The ability to multitask effectively has emerged as an "ideal skill in our fast-paced society" with countless job advertisements seeking individuals "who are able to multitask" (Master, 2009). As society continues to place an emphasis on this ability, it requires an examination about the effectiveness of multitasking from a performance perspective to best comprehend the effects of the practice on the outcomes borne from it. As understood from the

concepts discussed earlier, the brain is only capable of processing tasks simultaneously when there is not an "overlap in cognitive constructs between tasks," otherwise the results of the process are hindered by cognitive "interference" (Borst, Taatgen and van Rijn, 2010).

Threaded cognition provides a context to evaluate one of the lauded aspects of a generation that has grown up with various technologies that are used while completing different tasks. In addition, this theory also establishes that results from multitasking take longer than those completed separately because of the strain on cognitive resources. Ultimately, the theory of threaded cognition is a means for understanding how the human mind completes tasks and the role played by sequential processing of tasks (i.e. one tasks is completed and then it is on to the next task or thread).

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# Student Preferences for Rapport-Building Traits of Online Instructors

Robert Wright
Department of Learning Technologies
University of North Texas
United States
robertwright@my.unt.edu

Greg Jones
Department of Learning Technologies
University of North Texas
United States
gjones@unt.edu

Adriana D'Alba
College of Education
Grambling University
United States
dalbab@gram.edu

**Abstract.** This paper reports on the findings of one segment of a larger triangulated study of student preferences for instructors' rapport-building traits and practices in online learning environments. Participants were undergraduate and graduate students enrolled in educational technology courses at a central Texas university. This part of the study employed a mixed-methods approach that employed the Likert-item assessment of learners' preferences and semi-structured interviews that supplied more-detailed information. Findings indicated a strong preference for behavior-based traits over pedagogically-based ones. These traits loaded into the components of Social Presence, Enjoyable Interaction, and Personal Connection.

## Introduction

Numerous studies have touched upon the benefits of rapport in both traditional and online classes. Strong, positive student-instructor relationships have been linked to higher student motivation (Eccles, 2004; Lowman, 1984), enhanced communication (Bjorner, 1993; Dixson, 2010), better classroom management (Docan-Morgan and Manusov, 2009; Murphy & Valdez, 2005; Sapon-Shevin, 1991; Tickle-Degnan & Rosenthal, 1990), and improved learning outcomes (Copeland & Warren, 2004; Devito, 1986; Frymier, 2007; Gorham & Christophel, 1992; Teven, 2001). However, the question of which instructor traits support the building of rapport remains largely unanswered (Frisby & Martin, 2010; Murphy & Rodriguez-Manzanares, 2012). To respond to this question, we must first define rapport; and then, come to understand how it can be introduced and supported in instructional settings.

For the purposes of this study, rapport in online learning environments was defined as "a close and interactive relationship that is built upon trust, shared control, and engagement in activities that are aimed at advancing the skills, abilities, or knowledge of a clearly defined group, and of its individual members."

Chickering and Gamson laid the groundwork for building rapport in "Seven Principles for Good Practice in Undergraduate Education" (1987). Although their study dealt solely with undergraduate students, the authors noted that these principles "work for many different kinds of students -- white, black, Hispanic, Asian, rich, poor, older, younger, male, female, well-prepared, underprepared" (p. 4). Chickering (with Ehrmann, 1996) later wrote on how web-based and other technologies could be used "as a lever" to implement these principles in online instruction. The principles are: (a) Encourages contact between students and faculty; (b) Develops reciprocity and cooperation among students; (c) Encourages active learning; (d) Gives prompt feedback; (e) Emphasizes time on task; (f) Communicates high expectations; and (g) Respects diverse talents and ways of learning.

## The Study

In exploring the issue of students' preferences for rapport-building traits, this part of the study sought to 1) identify the major rapport-building components that exist in online learning environments, and 2) detail a rank order of rapport-building traits possessed by online instructors

Participants in the study were undergraduate and graduate students. Most were enrolled in Education and Instructional Technology courses at the university. Current enrollment in an online course was not a condition for participation; however, experience in an online learning environment was required.

Participation in the study was voluntary. Recruiting of subjects was undertaken through purposeful sampling via email sent by educational technology course instructors or notices posted in their course websites. After reading a consent form, potential subjects were given the opportunity to participate through the selection of a button that initiated the first survey, Rapport-building Traits of an Ideal Online Instructor. Participants in this survey were contacted to complete a second survey, Rapport-building Practices of an Ideal Online Instructor. The findings of this second survey fall outside the scope of this presentation. At the end of this second survey, participants were given the opportunity to volunteer to take part in a semi-structured interview.

Data was first collected through an instrument of Likert-scaled items that drew from earlier, proven Likert-scale assessments (Creasey, Jarvis, & Knapcik, 2009; Crook & Booth, 1997; Gremler & Gwinner, 2000). This list of traits was finalized through a review of current literature (Chickering & Gamson, 1987; Crook & Booth, 1997; Ellis 2000; Goodboy, 2007; Moore, 1989):

Humor: This instructor has a good sense of humor.

Attitude: This instructor displays a positive attitude.

Contact: This instructor encourages contact between students and him/herself.

Active learning: This instructor encourages active learning.

Collaboration: This instructor encourages collaboration amongst students.

Time on task: This instructor emphasizes time on task.

Diversity: This instructor respects students' diverse talents and ways of learning.

Dependable: This instructor is dependable.

Informal: This instructor encourages informal (non-course related) communication from students.

Honest: This instructor is honest.

Organized: This instructor is very organized.

Trustworthy: This instructor is trustworthy.

Respectful: This instructor is respectful.

Expectations: This instructor communicates high expectations

Interactive: This instructor uses an interactive teaching style

Semi-structured interviews of willing participants completed the data collection efforts. The convergence of data from these sources brought together the similar findings to help create a more inclusive view of the results.

## Major Findings

Successful rapport-building appears to have less to do the instructor's attempts at being friendly, using a certain pedagogical approach, or aligning instruction to certain learning theories and employing related practices, and more to do with displaying traits that work with proper pedagogy, and can be conveyed within a technology-based learning environment. The participants in this study viewed all of the traits favorably. The traits of Honest, Dependable, Trustworthy, and Organized served as four of the top-five ranked items in the study. Primary component analysis confirmed their significance. The traits of Trustworthy and Respectful were also positioned favorably; but to a somewhat lower level. Principal component analysis identified traits related to Enjoyable Interaction and Personal Connection as components of rapport-building. However, Social Presence arose as the major component of rapport-building in online learning environments. This component also reaffirmed the subjects' preference for rapport-building behavior over pedagogy, with six of the traits being instructor-related: Dependable, Trustworthy, Honest, Organized, Attitude, and Diversity. Only three, Contact, Active Learning, and Interactive, related to pedagogy. Enjoyable Interaction consisted of the pedagogical activities of Time on Task, Collaboration, and Expectations. And Personal Connection was comprised of the traits Informal, Humor, and Respectful.

## Conclusion

This study examined student preferences for rapport-building traits of instructors in college-level online learning environments. The importance of this study lies in its identification and ranking of specific rapport-building practices that students respond positively to. This can open the door to richer student-instructor relationships and improved course management. The findings of this study provide instructional designers with a valuable tool for creating more effective online learning environments, could advance the development of pedagogy for online instruction, and assist students in understanding how their preferences for rapport-building practices could lead to increased satisfaction and improved learning outcomes.

As the use of technology-based learning environments continues to grow, the depersonalizing effects and impact on human interaction become more of a concern (Dickinson, 2010; LeVine, 2010; Nelson, 2008; Nilles, 2012; Richtel, 2010). Research in establishing rapport, creating social presence, and other methods for humanizing the online experience becomes more critical as the development and utilization of technology continues. The range of students' learning styles and instructional needs, the assorted instructional approaches and learning theories, the ongoing development and adoption of new technologies, makes it imperative that we continue to examine and experiment with the methods, processes, and tools that support rapport in online learning environments.

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# The Flipped Classroom: An Introduction

Pamela Ponners
Department of Learning Technologies
University of North Texas
United States
PamelaPonners@my.unt.edu

**Abstract:** The foundation of the paper is based on literature reviewed from electronic as well as traditional educational journals. Flipping a classroom is still a relatively new concept that does not have much quantitative or qualitative research supporting the educational relevance of the concept. However, the grass root movement by forward thinking educators has provided a source for predictive speculation on the possible success for the flipped classroom. In addition the paper speaks to the changing of the traditional student and the role technology has played in the evolution of learners. Technology has changed the basic characteristics of present day students, creating the digital learner. The paper addresses the changes the analog (traditional) teacher needs to address in their classroom to meet the changing dynamics of their students.

## Introduction

The digital world is no longer limited to passively sitting in front of a computer. Our personal lives have been invaded by technology and people "check in" with Face Book, Twitter, Four Square and other social media sites and games. Parents track their kids using Find Friends, iPhone Tracker and other GPS applications. Athletes track their speed and distance with wearable technology such as Nike's basketball training shoes that transmit data to your iPhone, or wrist bands like NikeFuel that turns exercise into an interactive game with your body being the game board. The electronic invasion through digital natives has greatly affected the educational world.

Children are growing up with this first digital generation of technology and looking for their educational needs to be met by a generation of analog educators. How is the growing concern of teaching digital natives to be addressed? One possible answer could be that of the *flipped classroom*, one of the newest trends in the secondary and post-secondary classrooms. This model, used often in STEM (Science, Technology, Engineering, and Math) education, has been around only a few years. This leads to the question: "Is a flipped classroom the answer keeping digital natives engaged in a lectured based educational system?"

"Flipping" a classroom is when direct teaching, which usually occurs *inside the classroom* and during the school day, instead takes place outside of the classroom. The reinforcement of this direct teaching, which usually occurs *outside of the classroom*, takes place in it. This idea is not new in the subject of law and humanities; however, it is new in the area of STEM classes. Humanities classrooms have implemented such designs for years as literature students read the novels outside of the classroom and discuss themes, plot, and other elements of narrative in the classroom. This helps ensure students understand how the skills, such as symbolism and foreshadowing are used in the writing (Berrett 2012).

## The Changing Classroom

The "revolution" of flipping a classroom began with Sal Khan who was just trying to help his cousin get through his math class. He sat in his closest and created videos, send them off to his little cousin as a means of direct instruction. He now has over 3,000 videos lectures and is the founder of the nonprofit Khan Academy website. Sal is not just any teacher; he is a highly intelligent man who graduated MIT in four years with two bachelors and master's degrees in computer science and math. He worked in the world of hedge funds before quitting his job and devoting

his time to his website. This digital space site gained national attention when Bill Gates mentioned it at a conference in 2010 saying that "Bringing this kind of creativity and new assessment tools for teachers could make a profoundly positive difference in education"(della Cava, 2012, p. 2) . Khan says: "We have 6 million visitors a month, so we think that students helping each other are the future. That community can become as popular as the videos themselves. It'll be like having free private tutors in the cloud" (della Cava, 2012, p. 2).

Having students more responsible for getting their curriculum information electronically has sparked a revolution. Kevin Bushweller, executive editor of Education Week Digital Directions, says: "Khan's timing is perfect, because students and parents are living in the age of YouTube, where video watching is routine." He goes on to remind us that "technology is here, and doing the same old thing (in the classroom) just won't work"(della Cava, 2012, p. 2).

## The Changing Student

Research has indicated that the digital learner has developed characteristics that are not shared with the learners of the past. Tim Windsor in his online article *Who are the Digital Natives? And What do They Want* defines the Digital Generation, also called Digital Natives, as "those currently between the ages of 11 and 30, who have grown up completely steeped in technology and, for the past 12 years, the internet." However, a more detailed list of character and learning traits can be extracted from *Teaching and Learning with the Net Generation* (Barnes, Marateo and Ferris, 2007). These traits include: multitasking, a need for instant gratification, are easily bored, and desire for different forms of communication. As learners, the Digital Generation is more educationally driven, more independent and autonomous. Glenn goes on to say "they need self-directed learning opportunities, interactive environments, and multiple forms of feedback and assignment choices that use different resources to create personally meaningful learning experiences" (Gleen, 2000, as cited in Barnes, Marateo, & Ferris, 2007, p. 2). Finding similar characteristics, researchers found that Net Gen students wanted more hands-on, inquiry-based approaches to learning and were not as willing to be passive learners (Gatson, 2006, p. 12; Hay, 2000, p. 7). Khan's idea of allowing educational lectures to be at the fingertips of the digital learner is one way to allow the learner to take more responsibility for their education.

It was Khan's website that has given the classroom teacher a foundation to start flipping their classrooms. Although it would be best if teachers created their own video or podcasting for students to watch, Khan's website gives a teacher over 3,000 videos to choose from to enhance their curriculum. Other sites, such as YouTube and iTunes U, also provide support for getting started on flipping a classroom room. Flipping in the post-secondary environment has been happening for years, under a different title. In post-secondary classrooms, Eric Mazur at Harvard University has been using a teaching method he calls "peer instruction" for over 21 years. In his teaching model, students work in small groups to answer conceptual questions. Mazur says that "Simply transmitting information should not be the focus of teaching; helping students to assimilate that information should" (Berrett, 2012, p. A17).

At the University of Michigan in Ann Arbor the math department has flipped its teaching. Students are required to do their reading ahead of time, which is new for the math department. The teachers give a review of the reading and then observe while the students attempt to demonstrate what they learned through their out of classroom studies. "We are asking them to solve problems that are not template problems. In your presence they're learning how to think, and we're learning what they're struggling with," says Ms. Rhea, a professor and director of introductory math program at the University of Michigan. (Berrett, 2012, p. A17). In 2008, at the University of Michigan, teachers gave students in both traditional and flipped classrooms, a pre and post survey to determine knowledge growth. The results show that the students in the flipped environment showed "gains at about twice the rate of those in traditional lectures" (Berrett, 2012, p. A18)

Two teachers in secondary education, Aaron Sams and Jonathan Bergmann, flipped their classrooms and assist others in doing so as well (Brunsell & Horejsi, 2011, p. 10). Although the process may be time consuming at first, the library of videos should grow and the process more comfortable as a teaching tool. The basic tools are creating or finding online podcast or tutorials that support your curriculum and then place them on a website so students can access them.

> "The key ingredient in this model is that teachers no longer lecture, the direct instructions done via video podcasts made by the teachers. Moving the 30-50 minute lecture outside the classroom frees up teachers to help students master the key concepts in each course."

(Berrett, 2012, p. 10)

One of the more exciting aspects of flipping a classroom is that it can free up lecture time to allow students to participate in more hands on activities that allow teachers to identify concepts students are struggling with and correcting misconceptions. Peer interaction in the small group activities also allows for students to learn from each other and to work though situations that allow students to discover the answer instead of receiving the answers. This method also helps students to take more responsibility for their education as they are responsible for watching the lectures outside of the classroom, similar to Mazur's model.

## Conclusion

Carl Wieman, associate director of the White House Office of Science and Technology Policy, says this about flipping classrooms: "It's a whole different paradigm of teaching." (Berrett, 2012, p. A18) Flipping a classroom requires a teacher to become more of a coach and less of an instructor. Someone who motivates the academic athlete to do their best and push for understanding, not just rote memorization (Berrett, 2012, p. A18). One of Bergmann's coworkers shared this: "I no longer go to work to perform five times a day; instead, I look forward to going [to class] and interacting with my students all day" (Brunsell & Horejsi, 2011, p. 10).

Not everyone is excited about the flipped classroom. Many people see multiple issues concerning flipping classrooms, especially in secondary settings. Lisa Nielsen outlines five major issues in her article *Five Reasons I'm Not Flipping over the Classroom.* Her concerns are: the growing gap in the digital divide, homework infringes on family time more time for bad pedagogy, the infrastructure for flipping a classroom correctly is not in place in our current school model, and the flipped classroom is built on a traditional model of teaching and learning (Nielsen, 2011, p. 2). Nielsen is not the only educator or researcher to question the effectiveness of homework. The debate concerning the educational academic benefits of homework verses the social detriment of homework continues to this day (Foyle, 1993; Kohn, 2007; Marzano, 2007).

Is a flipped classroom the answer to keeping digital natives engaged in a lectured based educational system? It is apparent that more time must pass and research must be conducted to determine how effective flipped classrooms are at impacting student learning. It is important for educators to remember that no system is flawless and adjustments must be made to be sure all students are able to function in a flipped classroom.

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# Philosophical Implications of Teacher Skills Demonstrated in the WhyPower Project

Cliff Zintgraff
Department of Learning Technologies
University of North Texas
United States
cliffzintgraff@my.unt.edu

**Abstract:** Ethnographic observations were made of the systemic outcomes of the WhyPower project. By systemic outcomes, the author refers to outcomes like teacher completion of evaluation surveys and their support for development of research findings, as opposed to other legitimate and important outcomes like student learning; stated differently, did teachers do what was necessary to support the identification of *project research results*? Through a simple coding process, the project team identified three kinds of teachers delivering the intervention: Riders, Programmers, and Designers, with selected teachers excelling both as Programmers and Designers. In the context of both positivist and naturalistic theory, and especially in consideration of the *Both/And* philosophical approach described by Bernstein (1995), it is suggested that both positivist and naturalistic skills were needed to support the research goals of the project.

## Introduction

The WhyPower project was an intervention to improve the learning outcomes of middle school students in STEM subjects; in particular, at the intersection of mathematics, science and career education. The project included internal and external evaluations supported by this researcher and two project managers (the *project team*), with the evaluations intended to measure engagement and learning outcomes for students. The intervention occurred in the spring of 2012 in twelve Texas classrooms. This paper does not consider the primary measurements taken in internal and external evaluation; rather, this brief paper documents a secondary, qualitative analysis that considers how teacher skills did or did not support efforts to perform effective evaluation that can lead to research results. The analysis is considered in the context of philosophical positions, and consideration is given to which philosophical position/s are most effective in supporting research aims.

## Literature Review

This brief paper builds from a summary of the WhyPower project, the idea of the ethnographic study, and the Bernstein position of *Both/And* philosophy.

WhyPower was a project funded independently by the Texas Workforce Commission and Next Generation Learning Challenges. The educational technology platform for the WhyPower project was Whyville, "the learning-based virtual world for teens and tweens" (WhyPower, 2012). Whyville has been in operation since 1999. The site claims in excess of seven million users since 1999 (Whyville.net, 2012). The site's teleport menu lists in excess of 50 activities, each sponsored by an external organization. Sponsors include non-profit, institutional, and for-profit organizations. WhyPower, now a product independent of the original project, is "a program and supplemental curriculum for teaching math and science to middle schoolers. WhyPower also teaches middle schoolers about careers in energy fields, and about careers in other STEM fields. Students learn math and science commonly found in 7$^{th}$ and 8$^{th}$ core academic standards." (WhyPower, 2012). During the grant-funded intervention, twelve schools and their associated teachers participated. Fourteen curriculum supplements were provided, with each designed to last one typical class period. Schools delivered a minimum of five of the fourteen supplements, with a focus on supplements containing math instruction and especially those teaching proportional thinking. All curriculum supplements also contained science content, and also career and technology education content.

Hammersley and Atkinson (2007) reported the origin of the term *ethnography* as nineteenth century Western anthropology, where the term indicated "a descriptive account of a community or culture, usually one located

outside the West" (p. 1). They wrote that after a period of wide adoption in anthropology, the ethnographic approach began to be used in studies of U.S. rural culture, and then of urban culture, and its use also spread to Europe. While it retained distinctiveness, it was also "swallowed up in a general, multidisciplinary, movement promoting qualitative approaches" (p. 2). Attributes of the ethnographic approach listed include direct researcher participation in the daily life of participants, doing so over an extended time, watching and listening, asking formal and informal questions, collecting artifacts, and gathering any available data. The focus of inquiry is not fully pre-determined but emerges from the research process. Geertz (1973) noted two ways to define ethnography, the textbook definition being "establishing rapport, selecting informants, transcribing texts…mapping fields, keeping a diary, and so on" (p. 311), but what "define(s) the enterprise…is the kind of intellectual effort it is…an elaborate adventure in 'thick description'…'Thinking and Reflecting'…'The Thinking of Thoughts'" (p. 312). For this paper, ethnography is defined as thoughtful and comprehensive research inquiry that emerges from the observations of researchers who are directly involved in the conduct of the research.

Both the philosophical and educational research literature raise the issue of false choices that some choose to enforce in teaching practice and underlying philosophy. Bernstein (1995) writes of "the Other" (p. 66) and the human tendency to reduce others through negative light based on our own terms and assumptions (Bernstein, 1995; Bernstein, 1976). Related is our tendency to take an "Either/Or" rather than a "Both/And" approach (Bernstein, 1995, p. 201). Discussing the debate between *study-in-context* vs. *universal positivist context*, he notes "the dichotomy which is suspect…*either* we concern ourselves exclusively with the variety, complexity, and detail of specific contexts of human performances, and with ad hoc descriptions and explanations of these, *or* we will be ensnared in the futile search for generality" (Bernstein, 1976, p. 80). This discussion evokes the debate between empiricist approaches to social sciences (focus on numbers) vs. qualitative approaches (focus on words). Ertmer and Newby (1993) described decisions to choose sharply between theoretical educational perspectives as "phonies all along" (p. 70) and advocated "systematic eclecticism" (p. 70) as a position supported in the literature. Alexander, citing Lewin and also citing Dewey, noted the quote of Lewin: "There is nothing so practical as a good theory;" and Dewey, "there is nothing so theoretical as intelligent practice" (Alexander, 2006, p. 213).

## Design and Methods

The current study was not originally envisioned by the project team. The core project evaluation consisted of teacher pre and post surveys, student pre and post surveys, and surveys on learning outcomes conducted by external evaluators. In addition, embedded assessment in Whyville indicated exposure and accomplishment for specific middle school mathematics, science and career education standards, and a mechanism to review overall accomplishment for a class. Results for core project evaluation are being documented separately. Of interest for the current paper is consideration of teacher attributes and behaviors, and how those factors did or did not support pursuit of research goals as described above.

The idea of this study grew ethnographically from the direct participation of the current author and two project managers (the project team) in the activities required to execute the intervention and collect data for analysis. The current author conceived the details of the original project in response to a grant offering, and prepared a grant proposal that was accepted in 2009 and renewed in late 2010. The current author and one project manager prepared a second grant that was awarded in mid 2011. Grant preparation included school district partners. For the first grant, one ISD partner local to the grantee in South Central Texas was included, and an existing ISD partner in Central Texas with prior Whyville classroom experience was included. For the second grant, an additional ISD partner in East Texas was added with whom the grantee had previously pursued grants unsuccessfully. In the process of grant preparation, the project team had various interactions with ISD administrators and teachers. It was agreed that the intervention would occur during the 2011-2012 school year. In addition, it was agreed that one day of professional development would be provided to teachers, that ongoing support would be provided to teachers, that a minimum of five classroom days would be allocated for the intervention not including pre and post tests, and that the researcher and project managers would make classroom visits during the interventions. Members of the project team were already acquainted with selected teachers, while other teachers and administrators were new partners. Each ISD determined what classes the intervention would be implemented in. Classes included integrated humanities/technology classes for advanced students, and also career and technology education classes. While the original intervention focused on 8$^{th}$ grade classrooms, many schools chose to add 6$^{th}$ and 7$^{th}$ grade classrooms using funding provided by the second (*Next Generation Learning Challenges*) grant.

Implementation of the intervention, collection of data, and selected classroom visits eventually occupied a substantial portion of the project team's time during the project. Schedules for development in Whyville,

curriculum, training and other program details demanded that the intervention occur in the spring semester of the 2012-2013 school year. One-day on-site training occurred in the December through February time frame and included participation from the current author and project managers, who interacted directly and frequently with teachers and administrators from participating ISDs, explaining project conception, goals, preferred pedagogy, logistical details, research data collection, and scheduling. Following training, extended interaction was required with teachers and administrators to schedule the intervention in a manner consistent with other requirements of their curriculum. In fact, scheduling of the intervention and data collection would occupy a substantial portion of one project manager's time and become the mechanism for frequent interaction with teachers and administrators. As the interventions began, the project team spent time in classrooms in all three partners ISDs, and would have frequent interactions with the twelve teachers delivering the intervention.

The core process was completed, and in early summer, data was collected and the project team met frequently to assess outcomes and prepare reports. It was in this time frame that it began to occur to the project team that teacher pedagogical approaches and skill sets differed significantly across teachers and were having significant and specific impacts on the data collection process and the team's overall ability to complete data collection and develop research outcomes. The current author began recording notes from our meetings regarding the attributes of teachers delivering the interventions. In one sense, the notes were ad hoc, often not tied to specific teachers, and almost certainly biased in unidentifiable ways because of the chance nature of which topics received focus in meetings and which tasks had already been completed in the project. On the other hand, the current author and project team were engaged as part of the research, and this inquiry clearly emerged as a direct result of our experience, consistent with a naturalistic, ethnographic approach.

The level of qualitative rigor was not high, but rather measured to the ad hoc nature of the inquiry, and done with enough rigor to develop a short study that might in turn point to additional research. The current author used the aforementioned notes to develop themes, and these themes were in turn discussed with and confirmed by remaining members of the project team. Speaking colloquially, the project team brought the analysis full circle, identifying teacher archetypes, considering which teachers fell into which archetypes, and then asking if those teachers made the level of impact one would expect from their archetype, as a confirmation. The project team did not consider it appropriate to discuss these findings with the schools and administrators themselves, but noted that administrators are very likely aware of which teachers are their high performers.

## Data Collection

Table 1 lists a sample of notes collected by the author during project meetings. Table 2 lists themes that emerged and were subsequently discussed with the project team.

| *Number* | *Note* |
|---|---|
| 1 | Surveys were received from Teacher A, and this is no surprise, this teacher is "on the ball." |
| 2 | Teacher B is responsive to email but not to phone calls. |
| 3 | Teacher C is not really interested in the program. |
| 4 | Teacher D is very good at teaching the content but not as good at completing the reports. |
| 5 | Teacher E has lots of questions about the post surveys—lots of questions—but it looks like they will be completed on time. |
| 6 | Teacher F is concerned about completing the post surveys in light of upcoming standardized testing, and called to ask when we need results by. |
| 7 | Teacher G is one of our best teachers and we will be visiting her classroom during an upcoming visit. We already have the post surveys returned. |
| 8 | Teacher H got the surveys done quickly but had many questions about how to deliver content and we are skeptical about outcomes. |

Table 1: Sample of Notes on Teacher Attributes and Behaviors during Project Meetings

| *Number* | *Theme* | *Number* | *Theme* |
|---|---|---|---|
| 1 | Schedule delays | 5 | Good programmatically |
| 2 | Minimal interest in program | 6 | Hard to reach |
| 3 | Good pedagogically | 7 | Gets by with the minimum |
| 4 | Works hard | | |

Table 2: Identified Themes

## Analysis

Discussion among the project team of the notes and themes led to the insight that all themes trace back to teacher attributes, and that all themes are consistent with three teacher archetypes that were identified by the project team: Riders, Programmers and Designers, which are defined in Table 3.

| *Archetype* | *Description* | *Tasks where archetype excels* |
|---|---|---|
| Riders | Did only what was required | Basic tasks from job description |
| Programmers | Excelled at programmatic tasks | Giving instructions and completing reports |
| Designers | Excelled at pedagogical tasks | Understanding and practicing pedagogy |

Table 3: Teacher Archetypes

The reasons for the minimal participation of Riders were varied and not necessarily reflective of their personal characteristics; for example, selected teachers were clearly instructed to focus on core curriculum and while appearing as Riders to us, might have been Programmers and/or Designers from a different perspective. Focusing on Programmers and Designers, their skills fell generally into quantitative/empirical vs. qualitative/constructivist categories. Programmatic tasks required both the giving and execution of instructions. Completing programmatic elements contributed to project empirical goals. Designer skills required analysis of curriculum vs. class goals, selection of focus areas in curriculum supplements, and guiding individual students to deeper understanding according to the constructivist pedagogy advanced by the program's professional development.

From the perspective of program staff, the teachers who contributed most to the intervention's systemic success were those who did well as both Programmers and Designers. Designers best matched the educational philosophy of the program. Programmers were intent on meeting the grant measurement objectives, without which the success of the intervention could not be judged. The teachers whose efforts generated the most systemic success for the intervention were those who executed well both in the quantitative/empirical and the qualitative/constructivist domains.

The author suggests that within the limits of the current study, Bernstein's (1995) *Both/And* philosophy is supported by this study's findings. Neither a positivist Programmer mentality nor a naturalist, constructivist Designer mentality were sufficient to support the research goals of the program. Rather, both effective teaching consistent with the program's educational philosophy and the ability to capture results in a timely manner are needed to support overall program success. As Dewey, cited by Alexander (2006), noted, "there is nothing so theoretical as intelligent practice" (p. 213). Intelligent execution of this intervention—execution that supported learning and evaluation—required that both positivist and naturalistic skills be practiced by teachers.

## Conclusion

This study was based on ethnographic observation. The observations are necessarily subjective and at best suggest additional research questions. A potential area of research is consideration of how teachers with strong constructivist teaching skills but without positivist inclinations fare overall in classrooms interventions. If reporting requires positivist skills, then the question can be posed whether measurement fundamentally creates disadvantage in *proving* the effectiveness of constructivist approaches. Such a question also highlights the importance of developing effective theory and practice for performing embedded assessment inside educational technology systems, removing that responsibility from teachers. This researcher believes additional research can influence how

a large national workforce of teachers can be effectively educated in both positivist and naturalistic philosophical/educational domains through in-service opportunities, and for new teachers, how they can be so educated during their university coursework.

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# Learning to Teach Online with the Rich Environments for Active Learning (REALs) Model of Instruction

Michelle Moore
Department of Learning Technologies
University of North Texas
United States
MichelleMoore3@my.unt.edu

Alana S. Phillips
Department of Learning Technologies
University of North Texas
United States
AlanaPhillips@my.unt.edu

Heather Robinson
Department of Learning Technologies
University of North Texas
United States
HeatherRobinson2@my.unt.edu

Anneliese Sheffield
Department of Learning Technologies
University of North Texas
United States
AnnelieseSheffield@my.unt.edu

**Abstract:** Online education in K-12 is on the rise and with it comes a need to educate pre-service teachers in online methods and philosophies. An introductory course in online teaching was developed to provide undergraduate students preparing to become teachers with a foundation in online teaching. The Rich Environments for Active Learning (REALs) instructional model was used to guide the design of the course. As an instructional model that emphasizes the need for student responsibility and initiative, collaboration, authenticity in the classroom, and generative learning, it was deemed by the designers to be a valid model for an online course in online teaching. It is proposed that this course be adopted, tested, and adapted by universities preparing K-12 teachers for the modern realities of technology integrated face-to-face classes, blended classes, and fully online classes.

## Design Proposal: Introduction to Teaching Online

The purpose of the proposed project is to develop an Introduction to Online Teaching course for undergraduate students studying to become K-12 teachers, also known as pre-service teachers. In addition to developing skills for future teachers of fully online and blended courses, this course would provide pre-service teachers with the basic skills needed to support a face-to-face classroom with Internet-based instruction.

## Literature

Online education is expanding and the K-12 arena is no exception. Student enrollment in K-12 online courses rose from 50,000 in 2000 to over 2,000,000 in 2009 (Dawley, Rice, & Hinck, 2010). A report from the

Sloan Consortium showed that during the 2007/2008 school year, 75% of school districts had one or more students learning through fully online or blended courses. The Sloan study goes on to reveal a 47% increase in K-12 online course enrollment between the 2005/2006 and 2007/2008 school years. The study also highlighted the vital role that online education plays in many rural schools where online courses are relied upon to offer core courses (Picciano & Seaman, 2009).

With the rise in K-12 online education comes a need to educate teachers in online educational methods and philosophies. In 2010, 12% of newly hired online teachers were first year teachers (Dawley et al., 2010). Undergraduate teacher programs offer little training in this area, leaving pre-service teachers unprepared for online teaching. Smith, Clark, and Blomeyer report that little more than one percent (1.3%) of teacher education programs offer any training related to online instruction (as cited in Barbour, 2013, p. 63). This finding is confirmed in a separate study of online educators that found "only 12% of brand new online teachers reported receiving college or university training" (Dawley et al., 2010, p. 21). Without appropriate training, Davis and Rose found most online teachers are inclined to try to merely transfer their face-to-face teaching methods to the online environment (as cited in Barbour, 2013, p. 62).

Unfortunately, for universities looking to expand their course offerings to include training related to online teaching, the path is not clear-cut. With so few universities offering such courses, there is little on which to build. Furthermore, the courses, certificates, and professional development programs that have been developed vary widely in intended audience, duration, and scope (Barbour, 2013) providing little in the suggestion of a best practice. It is our hope that this course can be one model, one resource, on that path to better online instruction.

## Proposed Methods

The continually emerging social technologies and portable hardware to support these technologies (Sims & Koszalka, 2008) may make this the perfect time to combine social constructivist principles with adaptive learning models. In a paper on transforming distance education, Tam (2000) states “constructivist principles provide a set of guiding principles to help designers and instructors create learner-centered, technology-supported collaborative environments that support reflective and experiential processes” (p. 57). Tam (2000) adds that a constructivist view “summons instructional designers to make a radical shift in their thinking and to develop rich learning environments that help to translate the philosophy of constructivism into actual practice” (p. 54).

This proposal is not an attempt to show the superiority of one social constructivist model over another. Most would agree that classrooms are best served by using a variety of models representing different theories of learning. “Where the curriculum is genuinely coconstructed in action, teaching methods are selected according to the needs of the moment and no methods in the teacher’s repertoire are assumed, a priori, to be good or bad” (Wells, 2002, p. 22).

The researchers have chosen to explore Rich Environments for Active Learning (REALs) as a model for the course because it appears to be well-suited for online instruction, allows the instructor flexibility, while appearing to be a solid representation of social constructivist teaching. The researchers are also intrigued by the scarcity of research available documenting REALs; it seems to be little-used.

Rich Environments for Active Learning, also known as REALs, is an instructional model that evolved from social constructivist philosophies. As defined by Grabinger and Dunlap (1995), who put a name to this instructional model, the characteristics of REALs are: active knowledge construction and evolution, indexed knowledge acquisition, and collaboration and social negotiation of meaning. The REALs model has five attributes that are necessary in meaningful face-to-face and online learning according to Johnson (2013) and Grabinger and Dunlap (1995). These attributes include:

- Student responsibility and initiative;
- Generative learning activities;
- Authentic learning contexts;
- Authentic assessment strategies; and
- Cooperative support.

Using the REALs model, learning activities are provided which engage students in collaboration. The understanding of a topic or subject is molded through experience rather than the more traditional transfer of the knowledge from the teacher to the student.

## Proposed Course Outline

The objectives for the course are based on research, standards, and recommendations from the most recognized educational technology groups in the field including organizations such as ISTE and iNACOL, the International Association for K-12 Online Learning (Cennamo & Kalk, 2005; Dawley et al., 2010; International Association for K-12 Online Learning, 2011; International Society for Technology in Education, 2007). The overriding objectives are as follows:

1. Learners should be able to truly engage students in an online learning experience.
2. Learners will be able to navigate current and emerging tools for online learning.
3. Learners will be able to identify and implement features that allow students to be successful in the online learning environment.
4. Upon completion of this course, learners will have designed two units of instruction and acted as a co-facilitator for one.

To achieve these objectives, the 16-week course has been divided into three major segments, each designed to engage students in authentic, student-driven activities with their peers. In the first segment, Weeks 1 through 5, the students will take part in activities designed to develop the community needed for the cooperative support that is key to REALs. These activities will also help students become familiar with the online environment. During these first weeks, students will also work in teams to choose and develop their first real online unit on a topic related to online learning.

In Weeks 6 through 12 of the course, the students will facilitate the delivery of the "Topics in Online Learning Project" they developed in the first weeks of the course. The proposed topics, adapted from research and educational technology standards, include:

- Access and equity online
- Using internet resources (including copyright and fair use issues)
- Online instructional design principles
- Online safety and netiquette
- Communication
- Managing group work and collaboration
- Assessment

Since each unit will be developed by a different team of students, activities will vary though the plans will have been discussed in a collaborative design review meeting with the instructor early in the process. This freedom and flexibility is in keeping with the REALs ideals of student responsibility and initiative and generative learning.

The remainder of the course will give students the opportunity to develop a second unit in their area of specialization, such as elementary education or high school science. This project again provides an authentic experience that will allow students to review and practice everything they have learned in the course to this point.

In addition to the core projects, there are several other types of activities that will appear regularly throughout the course. First, to assist in building community and additional skills for online teaching, the course will incorporate regular synchronous web conference meetings. In the first weeks these will be led by the instructor but as students move into teaching their own units, they will lead the synchronous meetings as well.

Student reflection will be another recurring component of the course. As students move through the course, they will be asked to report on their progress. These reflections will appear in the form of weekly project status reports and the design review meetings with the instructor mentioned previously. These reflective activities enrich the learning experience for the student but also provides insight as to a student's progress for the instructor.

Finally, sharing and peer feedback is important in the course as a means of authentic assessment. With the first project, each team will have the experience of delivering their unit to their peers. In teaching the unit, the students will learn a lot, in a very authentic way, about what works in an online course and what may be less effective. The students will have a similar experience with their second project, though on an abbreviated scale, as each student in the course evaluates and provides feedback on one other unit.

To supplement the experiential feedback, surveys and rubrics will be developed and utilized as well. As students develop their "Topics in Online Learning" units they will be asked to contribute elements to an assessment rubric based on the information presented and discussed in their unit. For example, the team with the Access and Equity unit might develop an assessment item related to a specific accessibility issue. As students progress through the topics, this assessment rubric will evolve with new assessment items being added each week. Students will then use this rubric to provide feedback on each unit each week. This same rubric will be used to facilitate the peer review process on the second course project. Through this process, students learn in multiple ways: first, they receive feedback related to improving their own online units; they learn through the process of critically evaluating the work of others; and, they benefit in the process of creating the elements of the rubric.

## Predicted Results

The goal of this online course is to prepare preservice teachers with the basic managerial and technical skills and resources needed to teach online (Cennamo & Kalk, 2005; Dawley et al., 2010; International Association for K-12 Online Learning, 2011; International Society for Technology in Education, 2007). After one semester, or sixteen weeks, the learner will be able to engage all students in the learning experience during a course; the learner will be able to navigate current and emerging tools for online learning during a course; the learner will be able to identify and implement support elements that allow students to be successful in the online learning environment; the learner will be able to design an online unit that provides their students with the access to learning materials and educational resources that supports a self-directed learner.

## Potential Impact

As a semester course, it will not be possible to prepare the students for every aspect of the development and delivery of an online course, but the course will expose learners to the tools, terminology, methods and resources for the online classroom. The experiences in this course should also be useful in helping these future teachers have a better idea of what to expect when they are presented with an opportunity to teach online.

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# The Clark-Kozma Debate through the Lens of Systems

Cliff Zintgraff
Department of Learning Technologies
University of North Texas
United States
cliffzintgraff@my.unt.edu

**Abstract:** The Clark-Kozma debate focuses on whether media or educational theory are responsible for learning. This brief paper re-examines the debate through the lens of systems. A short review of systems concepts is provided. Clark's and Kozma's positions are compared to systems concepts. While Clark's position does include systems characteristics, Kozma's is most consistent with the systems view. Media's impact on learning is clarified when considered through the lens of systems.

## Introduction

In 2005 the author of the current paper was enrolled in Dr. Kate Mackie's marketing class. In a particularly difficult week late in the semester, the professor wisely chose to organize an engaging class debate. She organized the class into two teams. She put this question to the class: "Has the Internet fundamentally changed marketing?" (Mackie, 2005). While one team focused on how the fundamental definition of marketing had not changed, the winning team focused on how the Internet had changed the fundamental definition of marketing; in other words, that team focused on the *systems effect*. During prior study of the Clark-Kozma debate, this author wondered whether systems effects were being considered in the debate. This paper surfaces attributes of the systems view and briefly considers Clark's and Kozma's position through the lens of systems. The current paper argues that viewing media through a systems lens more fully clarifies impact of media on learning. It also argues that Kozma's position receives increased support when the debate is viewed through the lens of systems.

## Literature Review

### Summary of the Clark-Kozma Debate

Recollection of the marketing class was evoked for this author during study of Clark and Kozma's debate about the role of media in learning. Clark believes that "there are no learning benefits to be gained from employing any specific medium to deliver instruction." (1983, p. 445). In later writing, Clark (1994) leaves room for media to play a role in later design stages for "particular learners in specific contexts" (p. 10). Kozma (1994) has a more optimistic view of the role of media in learning. He believes that the constraints of behaviorist theory interfere with articulating a more complete view of media's role. Kozma writes specifically about the value of systems thinking in considering media theory and media's impact; for example, how increasing student engagement leads to improved outcomes, with engagement being the underlying cause for this class of improvement in teaching and learning.

### Systems Thinking

A brief description of *systems* is in order. The modern conception emerged from systems engineering. The *NASA Systems Engineering Handbook* (Shishko and Chamberlain, 1995) defined systems as "a robust approach to the design, creation, and operation…[that considers] performance, cost, schedule, and risk" (p. 4). Ramo and St. Clair (1998) describe "the systems approach" as interdisciplinary and holistic. Skyttner (2006) lists tenets of systems thinking which include holism, system regulation via feedback, interdependence of objects, equifinality (many ways to reach the same objective) and multifinality (many outcomes from the same inputs). As it relates to instructional theory and instructional systems design, Romiszowski (1981) outlined the instructional design process as a system

considering *learning input*, *learning output* (outcomes) and *process*, and noted that there are legitimate reasons for instructional design to start at any of these three points. For example, if learning something in context is most important, starting with an embedded learning process makes sense and then constrains options regarding the input and output of an instructional design—one would choose the process before content and detailed objectives.

Checkland (2000) developed *Soft Systems Methodology (SSM)*, which brought systems approaches to social sciences. SSM's roots are attributed to action research, which grew from a desire to "avoid the reductionism of natural science…it describes early experiences of trying to apply 'systems engineering' outside the technical area for which it was developed" (Checkland, 2000, p. S12). *Cognitive Systems Engineering* defines a cognitive system as one that produces "intelligent action, that is, its behavior is goal oriented"; it acknowledges that systems include human cognition elements (Hollnagel and Woods, 1983, p. 589). Accompanying complex systems is consideration of architecture, which was seen in Bloom's taxonomy (Anderson, Krathwohl, & Bloom, 2005) and also in Gibbons (2003) four centrisms and seven layers of decision making in instructional design.

For this paper, we define systems attributes as *robust and holistic; regulated through feedback; balanced between performance, cost, schedule and risk; not reductionist to the point of non-functionality; allows for multiple starting points in system design; is human cognition-aware; and is architecturally sound*.

## Analysis

Clark's approach to media demonstrates one systems attribute, but ignores others, leading to an incomplete view of media capabilities. Clark (1983, 1994) asserted that media is at best secondary, that educational theory is primary, and that media contributes only by carrying the required theory. This view was articulated in his 1983 review of meta-analyses and other studies. His 1994 article provided additional interpretation of his findings. Clark's main points were: (1) any benefits of media can always be replaced by other instructional approaches; (2) media and method are confounded in studies showing positive results from media; (3) related to the prior item, such media-positive research fails to link to underlying benefits of instructional methods, which enumerate the real core principles that media may fulfill; (4) Media advocates ignore research on older media methods that support his view, methods like the introduction of audiovisual aids, erroneously treating media as a new thing; (4) there is too much focus on context, aka *ecological validity*; (5) in academia, the real motivation of graduate programs is to break free of foundational theories and exercise more control over their own programs, consistent with the desire of students to freely explore new media methods.

Clark is aware of the need to consider context; however, he gives precedence to "prescriptive research" (1994, p. 9) and believes that instructional theories and methods applied should be foundational, and that at the "local level, when generic methods are translated into symbol systems for conveyance by media to particular learners in specific contexts, then multiple instances of a required generic method may be possible" (p. 10), which this author asserts is another way of saying that Clark gives primacy to general theory over, to use a metaphor, what telecommunications professionals might call "last mile" concerns of how signals finally arrive.

Clark's focus on the primacy of educational theory evokes architectural soundness in systems. However, it does not recognize the possibility that media might in turn affect the architectural foundation of educational theory through a regulatory process, or that media might shift the performance-cost-schedule-risk balance in favor of more learning. Even though the possibility of feedback is not recognized, the very confounding Clark spoke of adumbrates the possibility of the existence of a feedback mechanism. Clark's approach fails several tests of whether an approach is a systems approach: it is primarily linear (first theory, then outcomes, no systems view); it does not allow for different starting points in design; it does not include context-aware feedback mechanisms; and it considers context a "confounding" rather than an essential element of instructional design (Kozma, 1994). It should be noted that Clark never claims to meet a systems test; this author however notes Clark's approach fails the systems test, as one step toward this paper's systems argument.

The Kozma (1994) approach better incorporates systems concepts as it makes the case for current and future impact of media for learning. Kozma cites evidence from the use of *ThinkerTools* affordances that provide visualization and simulation of Newtonian force and motion. Students demonstrated significantly greater understanding of the presented concepts. The *Jasper Woodbury* story-based approach to mathematics instruction led to significantly greater transferability to new problem sets. Clark would attribute this to instructional theory, yet this theory is in turn enabled by the affordances of the media, and the use of those affordances is enabled by the economic and logistical ability to deliver that soft media into classrooms. This demonstrates holism, improved

performance-cost-schedule-risk balance, and the avoidance of over-reductionism regarding cause and effect in learning.

Kozma's approach addresses external context, and it also expands on what is happening with the internal understanding of learners. Kozma asserts that "missing in [Clark's 1983] studies are any mentalist notions or descriptions of the cognitive, affective, or social processes by which learning occurs" (p. 8). Kozma describes a dynamic process that highlights the interaction of objects and processes where "the learner strategically manages available cognitive, physical, and social resources" (p. 8). Feedback to the learner and transfer to new problem domains is considered. Kozma acknowledges the importance of the analytical approach but contends that naturalistic approaches fill in detail and expose detailed causes; using Kozma's own analogy, naturalistic approaches explain not only *that* the tornado damaged the town, but *why*. Kozma specifically notes systems concepts, including the potential for unanticipated impacts, the complementary nature of analytical and systematic approaches, and notably "how constraints and tasks...confront teachers and classrooms" and their systemic impact. Kozma cites Schon in calling the design process a "conversation [between] the designer, the situation, and the medium" (p. 17) and that "the design does not emerge until the users interact with it" (p. 17). Kozma's approach demonstrates greater systems awareness including robustness, feedback and PCSR balance, and human cognition awareness; architecture is not directly noted but is necessarily present through the presence of feedback mechanisms.

The above analysis indicates that while the media may indeed carry the method, this does not relegate media to be less important than the method, or unable to affect the method in turn. As Clark notes, media may just be the carrier of the message, but it is possible for the carrier to change the nature of the carried as a result of the voyage. Returning to Romiszowski (1981), he noted how in a systems-based instructional design, there is input, output and process, and that design may start at any of those three points depending on which item is most constrained in the environment. For example, if a training environment places great emphasis on application and resists supporting the time and space needed for a formal classroom, one might set "on-the-job training" as the first instructional design decision–now the training input and training output are constrained by the primacy of training method  If one starts with process, and process mandates the use of media, and media is a factor in identifying goals, objectives and relevant instructional theory, then did not media impact theory selection? To the extent that media helps identify or prove educational theory as appropriate to a situation, this paper argues that media must receive credit as essential in a systems-based instructional design process.

## Conclusion

The behaviorist, theory-focused approach of Clark provides a useful check-and-balance and contributes to discovery of underlying architecture; it ensures that over time, assertions are subjected to rigorous analysis. Nevertheless, such studies inherently occur out of context and cannot fully account for the reasons for learning. Stated colloquially:  Yes, some prior studies that attributed media to learning were likely wrong—but that does not rule out media being the reason more students are engaged in learning, and it does not rule out media's systemic impact on the choice of educational theory used to carry that media to students.

This paper argues that systems context is essential to understand media's impact on teaching and learning. Applying a systems context better acknowledges real-world practice and considers how media choices interact and in fact affect the selection of theory in instructional design. Overall, Kozma's views better match the attributes of systems. Those views better incorporate holism, regulation through feedback, and factors like student engagement that are catalysts for learning. Areas for further research include assessing how media engaged students that would otherwise have missed learning opportunities, and also how media has affected the selection of educational theories to support instructional design.

Kozma (1994) insightfully notes that we risk being "on the sidelines of our own game" (p. 8) if we do not establish the relationship between media and learning. Viewing media through the lens of systems can help researchers and practitioners stay off the sidelines and in the game.

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# Designing Online Platforms to Increase Motivation for Learning

Josh Gordesky
Department of Learning Technologies
University of North Texas
United States
joshuagordesky@my.unt.edu

Michael Marmon
Department of Learning Technologies
University of North Texas
United States
michaelmarmon@my.unt.edu

**Abstract**: Online instruction requires a movement away from the traditional mode of instruction, a type of "monologue delivered in a passive lecture environment through the use of overhead projector or PowerPoint" (Limniou and Smith, 2010 P. 645). Consequently, the use of online platforms such as Moodle, Blackboard, and Schoology in distance learning classes brings up a challenging and important question for schools, professors, and students -- how should the information be organized? Should the professor arrange information and have the student adapt to the system? Should the instructor follow best practices in information architecture, in other words look to well-designed websites and databases, to bring over ideas on how to arrange information so that it can easily be found by anyone? Perceptions and attitudes about the difficulty or simplicity of using any website or database can have a tremendous impact on both the instructor and the student. As a result, this paper will show that instructors should view online learning platforms from the student's perspective, arranging the information according to sound information architecture principles that enable users to find data with a few mouse clicks.

## Introduction

The growth rate of students enrolling in distance learning classes is "around 360,000 each year" which translates to roughly an increase of "18.2%" (Allen and Seaman, 2005). With these increases comes a greater demand for effective, easy-to-use online platforms (Moodle, Blackboard, Schoology) to store information such as instructions for assignments, discussion boards, a syllabus, articles, reports, and videos. An online learning platform, a term used interchangeably for a learning management system (LMS), provides the backbone for the process of organizing the two primary types of distance learning classes: (1) synchronous (students logging onto the same website at the same time) and (2) asynchronous (students accessing information individually at their convenience).

## Instructor Perceptions about Online Learning Platforms

A predominant belief among distance learning instructors is that the purpose of using online platforms is to provide students a place to access "learning materials and activities while tracking participation and progress through data systems and assessments" (Falvo and Johnson, 2007 P. 40). That notion is the cause of many problems for distance learning students. Put another way, when faculty members view an online learning system merely as a website where the course materials reside to later be used by the students, the learning experience will fail due mainly to the student's high level of frustration.

Furthermore, a learning management system allows an instructor to manage "the education process rather than merely delivering course and training materials electronically" (Al-Busaidi and Al-Shihi, 2010). The concept of managing the process -- a concept used a lot in service industries such as consulting and financial services -- again brings to mind the requirement to serve the needs of the client (in this case, the student) by organizing data according to how the student (the client) can easily find it. However, instructors sometimes view learning

management systems as a hurdle because of the requirement to redefine their role as an instructor, to include developing the student's mindset in arranging information. Yang and Cornelious (2005) expand on this struggle inherent in the instructor's redefined role in noting the move from a "professor centered education model to one that is student centered." This change in emphasis from the needs of the teacher to those of the students in terms of pedagogy and the organization of information is a reversal of their role in a traditional face-to-face classroom. For the instructor, this move requires a reevaluation of how information is presented and transferred to the student.

A further examination of an instructors' reluctance to learning about how to best use the technology is the perceived belief that the instructors will ultimately fail or that their competency level with using various technologies is insufficient or lacking (Gibson, Harris and Colaric, 2008 P. 356). In addition, some instructors "revealed that emotional distance, feedback, and structure" are important concerns held towards teaching in an online environment (Morris, Xu and Finnegan, 2005 P. 67). Yet, closing the emotional distance or enabling feedback discussions is difficult or impossible if the students cannot quickly and easily locate the places to fulfill those goals. As a result of the hesitancy to find innovative ways to organize information on these platforms due to fears of some kind of failure, many instructors do not view the manner in which information is organized on the platforms from the user's (student's) perspective. This lack of understanding on the instructors' part tends to "affect their initial acceptance of computer technology and their future behavior regarding computer usage" (Yuen and Ma, 2008 P. 230).

Exposure or training to best practices for organizing information online would counter an instructor's reluctance to "learn about technology in the classroom" (Mills, Yanes and Casebeer, 2009 P. 26). The evidence exists for instructors to change their perceptions about providing information on the platforms because their students will be open to it (Song, Singleton, Hill and Koh, 2004). Studies have shown that students view these platforms in a positive way as a tool that is "flexible, convenient and provides greater reflection in their interaction with peers" (Song, Singleton, Hill and Koh, 2004).

## Student Beliefs About Online Learning Platforms

Still, Kushnir (2009) notes the prominent complaint voiced by online students is that "they are overloaded with vast amounts of information, and that they often feel more burdened in those courses compared to face-to-face courses" (P. 289). Mupinga, Nora, and Yaw (2006) explain that a student's feelings toward learning in general are determined by a myriad of factors not simply convenience of course offerings including "various learning styles, backgrounds, and levels of preparedness" (P. 185). The level of preparedness, especially in distance learning classes, correlates directly with the way that information is organized.

The better-organized information is according to the student's perspective; the greater student motivation and satisfaction will be in the online learning environment. As a result, many instructors will likely convert negative perceptions of using online platforms to positive ones. This conversion could include an understanding of the institution's chosen learning management system and adopting the role of a "content curator." Hottenstein (2012) explains this notion that the instructor "is responsible for identifying the appropriate information, ordering it, and providing the context for the information (P. 97). Moreover, by assuming more responsibility over the content and format, instructors will become experts in working with the platforms, "allowing them to see their importance" within the context of their virtual classroom (Mills, Yanes and Casebeer, 2009 P. 26).

## Conclusion

The desire to take online courses is expected to continue its steady growth into the future as students find immense value in being able to complete coursework anywhere and at anytime. Yet, with all of its virtues, effective online learning is based upon perceptions and attitudes from both the course's instructors as well as the student. As discussed earlier, the technology and the presentation of information play a vital role in determining motivation, as well as the instructor's attitude towards teaching in an online classroom. It is for these reasons that perceptions must be changed to reflect the reality of either teaching or learning online. Ultimately, much of this is determined by the instructor, who should take an interested role in the learning platform that results in them being "knowledgeable and comfortable" with it but also able to "construct a course that is easy to use and access" (Palloff and Pratt, 2000 P.4).

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# 9th Grade Responsibility Levels: Better or Worse?

Michelle Giles
Department of Learning Technologies
University of North Texas
United States
lindagiles@my.unt.edu

Rhonda Ritter
Department of Learning Technologies
University of North Texas
United States
rhondaritter@my.unt.edu

Ellen Zimmerman
Department of Learning Technologies
University of North Texas
United States
ellenzimmerman@my.unt.edu

**Abstract:** This study will evaluate high school teacher's opinions about the current responsibility level of their ninth grade students. The questions to be evaluated include those that evaluate the teacher's perspective regarding student responsibility levels increasing or decreasing, factors they perceive are involved with those changes, methods they use to improve responsibility levels, and failure rates of their students.

## Introduction

Today's students are part of what is called Generation Y or the Millennial Generation. These students have been raised in a society that is totally immersed in technology. Most have never seen a pay phone and do not know what a fax number is for. Their experiences have created a different view of learning and acquiring knowledge. The availability of information on the Internet has created an expectation of instant gratification in them. How has this affected their learning and responsibility levels?

## Definition of Terms

Responsibility is defined as "the quality or state of being responsible." (The Merriam-Webster Dictionary, 2013). Researchers use many different factors to determine a working definition of student responsibility. For the purpose of this study, responsibility will be defined as the opportunity or ability to act independently and make decisions without authorization or readily assuming obligations, duties, etc.; dependable; reliable.

Generation Y is defined as "the generation born in the 1980s and 1990s, especially in the U.S." (Dictionary.com's 21st Century Lexicon, 2013). This generation of individuals has spent their lives immersed in technology and most cannot imagine it any other way. For the purposes of this study, we will use the definition as stated with the addition of the fact that they are increasingly familiar with digital and electronic devices.

Millennial Generation is another term used in reference to Generation Y individuals. "A term used to refer to the generation, born from 1980 onward, brought up using digital technology and mass media; the children of Baby Boomers; also called Generation Y" (Dictionary.com's 21st Century Lexicon, 2013). For the purposes of this study, we will use the definition as stated.

Because the use of the term instant gratification is relatively new, there were no suitable sources to quote the definition from. Based on the definition of instant as an infinitesimal space of time; *especially* **:** a point in time

separating two states (The Merriam-Webster Dictionary, 2013) and the definition of gratification as a reward, recompense; *especially* **:** gratuity (The Merriam-Webster Dictionary, 2013), our definition of instant gratification for the purpose of this study will be considered as the ability to get an answer or the satisfaction of an answer without putting forth effort or waiting with regards to the use of the term in an educational setting.

## Problem Statement

In today's society of teaching to the test and No Child Left Behind, student responsibility levels have come into question. The assumption is that student's poor performance is due primarily to teachers' efforts. It is expected that teachers take full responsibility for student learning. If students fail then it must be because poor curriculum, improper instruction, and teachers' low expectations. Given these assumptions students are not as motivated to work hard since the responsibility falls on teacher performance instead of the student taking responsibility for their own learning. Greater access to technologies such as the Internet and mobile devices also attributes to a lack of students' responsibility level.

The purpose of this study is to evaluate high school teacher's opinions about the current responsibility levels of their ninth grade students in this age of instant gratification. As such, the specific research question to be addressed through this study is: What are the perceptions of ninth grade teachers regarding the responsibility levels of ninth grade students based on the availability of the Internet and instant gratification? The following literature review further frames this research effort.

## Literature Review

Mioduser, Nachmias, and Forkosh-Baruch (2008), suggest that in this age of the knowledge society, students will be expected to be independent, lifelong learners with the ability to use higher order skills and work in teams. While there have always been changes over time, the amount of changes that have taken place over the last thirty years, a relatively short period of time, have had large implications for the population. Individuals in this lifetime have had to adapt and continue to learn to keep up with the changes while those that were born into this era have known nothing but change and the adaptability necessary to keep up with the ever-changing world.

"An important component of academic success is students' motivation and ability to take responsibility for their own learning" (Dembo & Eaton, 2000, p. 473). Dembo and Eaton's study evaluated behaviors that influence learning, specifically motivation in middle-level schools. Their research conclusion stresses the importance of student regulated learning and motivation as the key to student success. In the case where students have teachers who are not responsive to their needs, students must be taught how to develop their own education skills.

Middle school is an important transition period for students. Dembo and Eaton (2000) suggest that "For many individuals, this transition represents the beginning of a general deterioration in academic performance, motivation, self-perceptions of ability, and relationships with peers and teachers" (p.473). "The future for many adolescents is bleak unless educational reforms influence their motivation and academic achievement" (Dembo & Eaton, 2000, p. 474). For this reason, the current state of ninth grade responsibility levels is significant in the evaluation of what works to improve student motivation and responsibility. Without a clear understanding of where students stand with regards to responsibility, how can we develop a plan for improvement? "According to the National Middle School Association (2003), these students [Middle School] are forming attitudes, values, and habits of mind that will largely direct their behavior as adults" (O'Callaghan, 2008, p. 11).

According to Osit (2008), what he calls Generation Text kids in particular have significant problems learning how to cope with not getting what they want, and even with a slight delay in gratification (Osit, 2008, p. 59). Furthermore Generation Text kids do not have a high work ethic (Osit, 2008, p. 87). They are accustomed to getting what they want quickly and easily and are "used to getting what they want with minimal effort" (p. 86). This is partly attributed to the number of technology tools and the ease of getting information.

Research by Lewis, Romi, Qui & Katz (2005) suggests that various countries have expressed the concern that schools need to produce more responsible citizens. There are a variety of causes that have been cited as culprits to the perceived lack of civility of youth including "…young people's increasing access to technology leading them to find school boring…" (Lewis, 2001, p. 307).

## Methodology

To explore the perceptions of ninth grade teachers regarding student responsibility levels over the last ten years, data will be collected using an email survey that will be completed by ninth grade teachers currently employed within the Region 5 Area in Southeast Texas. The study will seek to determine if ninth grade student responsibility levels have increased or decreased over the past 10 years.

## Participants

The sample for this study will consist of current teachers recruited through the Region 5 Area in Southeast Texas. Potential participants will be invited via an email request sent by the researchers, and only those who have taught ninth grade students for at least five of the last ten years will then be recruited. This process will be achieved by clicking a question in the survey that will ask the participants if they have taught ninth grade students for at least five of the last ten years before they are provided with the survey questions.

## Survey Instrument

The survey instrument will consist of one informed consent verification question, 14 closed ended questions, and 2 open ended questions. The remaining questions of the survey will ask for demographic information such as gender, age, employment status, marital status, race/ethnicity, and household income. Participants will first be informed of their right to decline participation or to withdraw at any time during the survey. The survey will be accessed by clicking on a link to the survey tool Qualtrics where the survey results will be collected confidentially providing only the research team members with access to the results.

## Data Collection and Analysis

Data will be collected by means of a self-created survey instrument in order to gather information based on participant's experiences with the responsibility level of ninth grade students over the last ten years. The online survey instrument will be constructed by the researchers in Qualtrics, an online survey implementation tool. Participation is voluntary and the responses will be confidential. All surveys will be concealed and no one other than the primary investigator and assistant researchers will have access to them. The survey will be active for two weeks. In the first week an e-mail message will be sent to all available active email addresses on the Region 5 email system via the primary researcher inviting them to participate in the study. A link to the survey will be provided in the email. The message will outline the purpose of the study, provide instructions for completing the survey, and inform the potential subjects of their rights regarding participation in the study. After reading the rights of participation, the subjects who agree to participate will complete the survey. Those who do not agree to participate will close their browser window. The subjects will be provided with contact information in case they have questions regarding the study and will be reminded of confidentiality and of their freedom to discontinue participation at any time. At the end of a one week period, those who have not responded will be sent a follow-up e-mail, including the same information as was offered in the initial email communication and reminding recipients that the survey will still be active for those who have not yet completed it. At the conclusion of the second week, the survey will be closed to participants. Data will then be downloaded from Qualtrics for the purposes of data analysis.

## Discussion

There will be several limitations that may affect the study. One of the limitations to the study may be a small sample size that would not be a good representation of the actual number of teachers who have taught ninth grade students for the past 10 years. A second limitation of study is the potential of a low response rate. A final limitation of the study is the potential for incomplete survey responses.

Previous studies have shown that while curriculum and lesson design do have an impact on learning, there are other factors such as discipline that will impact responsibility and student success (Lewis, 2001). Another study indicates that students are not prepared for today's version of literacy referred to as hyperacy. The tools needed for learning in this society are very different from old methods of literacy education (Mioduser, Nachmias, & Forkosh-Baruch, 2008). Upon completion of the current study it is anticipated that the results will reveal that student responsibilities at the ninth grade level have decreased over the past 10 years due to availability of the Internet and instant gratification. The implications of this research will have a direct impact for teachers, parents, and administrators for creation, development, and delivery of current curriculum.

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# The Relationship between Student Satisfaction and Attendance at Synchronous Class Meetings in Online Graduate Courses

Michelle Moore
Department of Learning Technologies
University of North Texas
United States
michellemoore3@my.unt.edu

Brenda Quintanilla
Department of Learning Technologies
University of North Texas
United States
brendaquintanilla@my.unt.edu

**Abstract:** This study examines the relationship between student satisfaction and attendance at synchronous class meetings in online graduate courses. Graduate students in online courses at universities across the United States were recruited to participate in the study. The researchers used a 52-question survey tool, including items from the Course Experience Questionnaire (CEQ), which has been used across the university system in Australia since the early 1990s. A total of 17 individuals began the survey; 12 completed the entire instrument. Upon analysis of the data, it was determined that there was not a correlation between satisfaction and attendance, but there was a correlation between satisfaction and the number of recordings watched. Though the results of the study show statistical significance, the small sample size means that the results have little to no practical significance. An additional study with a larger sample is needed to produce a much clearer picture of the relationship

## Introduction

Over the past few years there has been increasing interest in the use of web conferencing tools to facilitate collaboration in distance education courses (Suduc, Bizoi, & Filip, 2009). With the advancement of telecommunication technologies, synchronous web conferencing tools have evolved (Grant & Cheon, 2007) and now offer students and teachers the best solution for bridging the communication gap in online learning (Stewart, Harlow, & DeBacco, 2011). Larger, portable video conferencing equipment has morphed into webcams and online web conferencing tools like Adobe Connect, Blackboard Collaborate, WebEx, and GoToMeeting. Zijdemans-Boudreau (2009) explains that web conferencing "technology supports application sharing, web browsing as well as other interactive features such as polls or surveys, and the ability for participants to manipulate the presenter's screen, for example: to write on a whiteboard. Also, the live sessions can also be recorded and made into archives" (p. 1). Many years of research investigating the role of interactive technology have shown that web conferencing allows rich collaboration to be re-invented within the online learning environment (Zijdemans-Boudreau, 2009; Baecker, Moore, & Zijdemans, 2003). These built-in tools allow for real time bidirectional communication (Suduc, et al., 2009).

A 2004 paper by Levy surmised that student satisfaction is a major factor related to a student's decision to drop out of an online course. Levy (2004) also reported that a 2003 study conducted by Shea, Picket and Pelz indicated that student satisfaction correlated with an instructor's direct interaction with that student. In addition, a study by Jung, Choi, Lim, & Leem (2002) suggested that students who participated in online collaborations communicated a greater satisfaction level than students who did not. From the research, it is clear that student-teacher interaction plays a role in student satisfaction.

There are several studies that examine the various forms of synchronous interaction in online learning (Grant & Cheon, 2007; Jung, Choi, Lim & Leem, 2002; Moore, 1989). However, there are few studies that focus specifically on synchronous interaction through web conferencing as a means to promote student satisfaction in a distance learning courses. The lack of published research regarding student satisfaction and synchronous web

conference attendance prompted further investigation. This research study will explore the use of synchronous web conferencing in online graduate courses to determine if student attendance impacts a student's satisfaction with a course. The researchers of this paper hypothesize that there is a relationship between satisfaction and synchronous class meeting attendance.

## The Study

For this study, we recruited 17 (52.9% female, 47.1% male) graduate students in online courses at Universities across the United States. Participants were initially recruited through email messages sent to selected students and instructors who were either known to be enrolled in or teaching online courses. Information about the survey was also posted to Twitter, a Facebook group for online doctoral students at a university in the Midwest, and through LinkedIn groups for several regional and national distance learning and educational technology organizations. In each of these communications, no incentives were offered. Recipients were encouraged to distribute information about the study to students, peers, and colleagues within their university and beyond. Among those who responded, 5 surveys were deleted from the final data set either due to incomplete questionnaires or because the respondent's course did not actually incorporate live online class meetings.

### Survey Instrument

Each student in the sample responded to a single self-report, online questionnaire consisting of 52 questions focused on four areas of interest, including student demographics, course information, student attendance at online class meetings, and student satisfaction.

The first section of the survey presented respondents with 11 questions designed to collect demographic data. Of those, there were four questions related to experience with online learning, web conferencing technology and overall comfort level with web conferencing tools.

After completing the demographic questions, respondents were asked to consider one online course they had taken within the past twelve months and to use that course to answer all remaining questions. To learn more about the course being evaluated, the next set of questions was structured to elicit information about the course the student had selected to evaluate. There were 4 questions asking specifically about the online class meetings, such as how often meetings were held, what time the meetings were held and whether they took place during the week or on weekends, and if students had access to recordings of the class meetings.

The next three questions asked students to report on the percentage of class meetings they attended and the number of recordings watched. Students attending fewer than 50% of all online class meetings were asked to explain the reason for attending less than half of the class meetings. The final two questions in this section provided students with the opportunity to comment on the best aspects of the online class meeting as well as those aspects most in need of improvement.

The student satisfaction portion of the instrument was based on the Course Experience Questionnaire (CEQ) which has been used across the university system in Australia since the early 1990s (Grace, Weaven, Bodey, Ross, & Weaven, 2012; Wilson, Lizzio, & Ramsden, 1997). While not designed explicitly for this application, the CEQ is regularly used "as a proxy for student satisfaction" (Grace et al., 2012, p. 1). Furthermore, research suggests a relationship between items measured in the CEQ and a student's overall satisfaction (Grace et al., 2012; Ramsden, 1991).

The Course Experience Questionnaire has evolved over the years with varying numbers of questions (Ramsden, 1991; Wilson et al., 1997), but the version used most often today consists of 25 items spread across five scales (Grace et al., 2012). This 25-item CEQ includes 6 items to measure good teaching (GT scale); 5 items measuring clear goals and standards (CG scale); 3 items to measure appropriate assessment (AA scale); 4 items related to appropriate workload (AW scale); and 6 items measuring generic skills efficacy (GS scale), which replaced a scale measuring emphasis on independence on previous versions. The last item on the CEQ was related directly to overall satisfaction (Grace et al., 2012). Each item is measured by a 5-item Likert scale ranging from Agree to Disagree.

The questions from the CEQ were supplemented with 4 additional satisfaction questions as proposed in the Course Experience Quality and Satisfaction (CEQS) Model. The CEQS model, developed to study the use of the CEQ as a measure of satisfaction, introduces four questions focused solely on satisfaction. These four questions, like the CEQ, use a 5-item Likert scale ranging from Agree to Disagree (Grace et al., 2012).

**Participants**

The resulting sample of 12 students was 57.1% female. The largest percentage of the group, 41.7%, falls in the 35-44 age group (25 – 34, 25%; 35 – 44, 41.7%; 45 – 54, 25%; and 55 – 64, 8.3%). The majority (83.3%) of respondents hold Masters degrees (Bachelors degree, 16.7%; PhD, 0.0%; etc.) and are pursuing doctorates (doctorate, 66.7%; masters, 16.7%; graduate or professional degree, 8.3%; None, 8.3%). Most (75.0%) live in Texas (Wyoming, Arizona, and Hangzhou, China, 8.3% each). On average, the students report 45.42 hours of paid work a week and have 1.5 children age 6 and over and 0.5 children under the age of 6 living in the home.

As a whole, the students are not new to online learning. The average number of online courses completed by the respondents within the last twelve months is 5.5 ($SD$ = 3.705, range = 12); 81.8% of these courses incorporated web conferencing sessions. A majority of those students responding use web conferencing tools regularly to some degree; 25% use web conferencing tools daily, 25% use them weekly, 33.3% use web conferencing only once or twice a month, 8.3% use it two or three times a year, and 8.3% do not use it at all. More than 75% of the students indicated they are very comfortable with web conferencing tools (on a scale of 1 to 5 with 5 being most comfortable, 66.7% marked 5; 8.3% marked 4; 25.0% marked 3).

## Findings

Student satisfaction scores as measured by the mean of the one satisfaction item on the Course Experience Questionnaire (CEQ) and the four additional satisfaction items presented in the Course Experience Quality and Satisfaction Model (CEQS) did not vary with the percentage of live online class meetings a student attended ($r$ =.141). Likewise, there was no correlation of statistical significance between scores on the other CEQ scales and percentage of meetings attended.

Our calculation did find, however, correlations between the percentage of recordings watched by a student and scores on several scales of the CEQ. In each case, the mean of all items within a scale were averaged and then correlated with the percentage of recordings reported to have been watched. Again, for the Overall Satisfaction scale, we combined the original CEQ item with those from the CEQS. As a result, the data revealed correlations between number of recordings watched and scores on the Overall Satisfaction (OS) items ($r(10) = .683$, $p < .05$), the Good Teaching (GT) scale ($r(10) = .68$, $p < .05$), and the Generic Skills (GS) ($r(10) = .759$, $p < .01$) scale. Given that the CEQS study by Grace et al. (2012) found a relationship between Overall Satisfaction and scores on the Good Teaching and Generic Skills scales, the fact that we found correlations on these three scales is not unexpected. This same research though would have caused us to also anticipate a correlation on the Clear Goals scale.

## Conclusion

For this study we hypothesized a relationship between satisfaction and synchronous class meeting attendance, which our results did not support. However, given the very small sample size of 12, any correlations found would not have had any practical significance. We did find a positive correlation between the percentage of recordings watched and student satisfaction as reported above. Again, though we did calculate a correlation statistically, there is no practical significance due to our small sample size.

There are several studies that provide research data indicating student satisfaction with synchronous interaction, although few highlight the correlation between real-time web conferencing and student satisfaction with their online courses. Many studies focus on student-teacher interaction, but not specifically synchronous web conferencing. The studies we reviewed that focused on interaction in an online environment indicated that student-teacher interaction is of great value for both the student and teacher (Grant & Cheon, 2007; Jung, Choi, Lim & Leem, 2002; Moore, 1989). Further research found only a limited number of empirical studies that focused on synchronous real-time videoconferencing with remote learners. A recent study by Stewart, Harlow & DeBacco (2011) indicated that both the students and instructor agreed that videoconferencing technology provides a means for a rich learning experience. On the other hand there have also been negative results in some studies. Freeman (1998) found that technical problems slowed down the experience. Interaction also seemed to be harder for some students because it was more difficult for them to initiate interaction during the session (Freeman, 1998).

Further empirical evidence is needed to corroborate the findings between synchronous web conferencing and satisfaction in online courses. The results of this study showed that viewing recordings of synchronous class meetings in an online course may be positively correlated with student satisfaction. Again, given the small sample size, these results are mostly just interesting and suggest that there may be a relationship worth further exploration. At the same time, the lack of correlation between attendance and satisfaction in this small study is not definitive either. We believe an additional study with a larger sample size would produce a much clearer picture of the correlation and that the impact of synchronous web conferencing in online learning deserves additional investigation.

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# Student Satisfaction in Online Learning Environments: Brief Paper on a Mixed Methods Study

Jennifer Miller
Department of Learning Technologies
University of North Texas
United States
jennifermiller254@gmail.com

Majed Tantish
Department of Learning Technologies
University of North Texas
United States
mtantish@hotmail.com

Cliff Zintgraff
Department of Learning Technologies
University of North Texas
United States
cliffzintgraff@my.unt.edu

**Abstract:** The use of online learning in education is growing rapidly (Means, Toyama, Murphy, Bakia & Jones, 2010) and presents challenges to universities (Durrington, Berryhill & Swafford, 2006). This brief paper summarizes results from a mixed methods study on student perspectives in online learning. Students at a mid-sized university in the Southwest United States shared their comfort level with LMS and asynchronous tools in the context of online learning environments. They shared the importance they place on different features in these tools. Findings indicated that most students place the greatest importance on the basics of the online learning experience.

## Introduction

"Online learning…is one of the fastest growing trends in educational uses of technology" (Means, Toyama, Murphy, Bakia & Jones, 2010, p. xi). Online learning environments will continue to grow. Durrington, Berryhill, and Swafford's (2006) study reported that 88% of institutions predicted in 2003 that post-secondary institutions would increase "the number of such courses during the next three years" (p. 190), and that as delivery systems move to online environments, related challenges will increase for universities.

Which online learning environment features are most important to students? Kirby, Sharpe, Bourgeois, & Greene (2010) pointed out the lack of research investigating student perceptions in online learning environments. Nevertheless, early observations begin to describe student perspectives. For example, the Durrington et al. (2006) study reported that students are eager to interact in online environments. Kirby et al. (2010, p. 163) listed advantages noted by students, including "access to quality learning resources, flexibility, greater choices of course content, increased self-reliance, and improved computer literacy skills." On the other hand, Kirby et al. documented disadvantages that included "feelings of isolation, technical problems, less contact with peers and instructors, low motivation, and the inability to communicate with others in the course" (p. 163).

This brief paper summarizes results from a convergent mixed methods study (Creswell & Clark, 2007). 43 student surveys and three qualitative interviews were performed to investigate students perspectives on the environment and tools used in online learning. The main research question was "*What environmental aspects of online programs affect student satisfaction?"*

## Literature Review

A review of the literature indicates that growth in online learning continues and that most growth in higher education is in online learning; that various theories are guiding online learning development and use; and that student perspectives have not been well represented when online learning experiences are considered. Means et al. (2010) and Durrington et al. (2006) highlighted growth in online learning and that online learning accounts for most growth in higher education. Kirby et al. (2010) noted the lack of student perspectives. Rogers' (2003) innovation diffusion theory, further supported by Chang and Tung (2008), and also by Richardson and Swan's (2003) theory of social presence, highlighted the importance of organization and teacher presence. Richardson and Swan (2003) noted that "students' perceptions of social presence…contributed significantly to the predictor equation for students' perceived learning overall" (p. 68). Related to social presence is the idea of rapport, and the idea that rapport improves discourse in many types of classroom settings (Jones, Warren & Robertson, 2009). *Constructivist theory* is highlighted in a study of nursing education. In that study, Ali, Hodson-Carlton and Ryan (2004) commented that constructivist theory and online learning are compatible; that "implications for improving [online] teaching are based upon the Constructivism Theory" (p. 111). Sher (2009) suggested that web-based instruction does face criticism to include communication issues and the feeling of isolation among participants.

## Methods

This study was completed as part of a doctoral studies class at a mid-sized public research university in the southwest United States. In a class of eighteen students, the professor formed two research groups of nine students each. One group studied faculty satisfaction in online learning, and the second group studied student satisfaction in online learning. Both groups were further subdivided into teams of three, with each team having a primary research question and three sub-questions. The current authors represent one team of three students.

The current study used a convergent mixed methods design as described by Creswell and Clark (2007). A survey included demographics and quantitative questions. A quantitative analysis was performed, and selected respondents were asked to participate in a fifteen-to-thirty minute qualitative interview. Interviews were coded and findings were merged during analysis. In a convergent design enhancement, the initial survey also contained qualitative questions that were used to validate that selection of questions was correct, to supplement qualitative interviews conducted following the surveys, and to inform future research questions. From a quantitative perspective, the participants represented a convenience sample from the classes of colleagues of the course professor.

## Data Collection

43 students completed the survey. 22 students were male, and 21 students were female. 33 were White, 5 African-American, 3 Hispanic or Latino, and 2 Asian. 37 reported living in urban areas, while 6 reported living in rural areas. 7 of the students had taught online courses themselves. The respondents were taking between 3 and 4 courses each, with most of them being online courses. 24 students were pursuing Bachelors degrees, 16 Masters degrees, and three Doctoral degrees. 27 reported full-time work, nine part-time work, and seven reported they do not hold employment. Professions were varied and included professional staff, teachers, managers, and full-time students. Three students completed qualitative in-person interviews following up on survey answers. Interviews were transcribed and coded.

## Results

Three quantitative Likert questions regarding tools in online learning yielded results where students consistently gave higher ranks to basic features over more advanced or highly interactive features. As an example, Figure 1 shows how students ranked basic synchronous features over more advanced features. In a Pearson product-moment correlation table between demographics and feature rankings, those with more experience in online classes gave more importance to basic features with statistical significance, especially for undergraduates. Qualitative

analysis made it clear that underlying the quantitative analysis is overall student dissatisfaction with online learning environments; as our interviewee "Eva" noted:

> They're in an asynchronous class, and they said their problem is they've never seen the professor and they don't get very good feedback…it's just overwhelming if you don't have a good calendar and structure reminding you what you need to get done, what the objectives are, what the classes is trying to do, and you know what your goals are and what the assignments are.

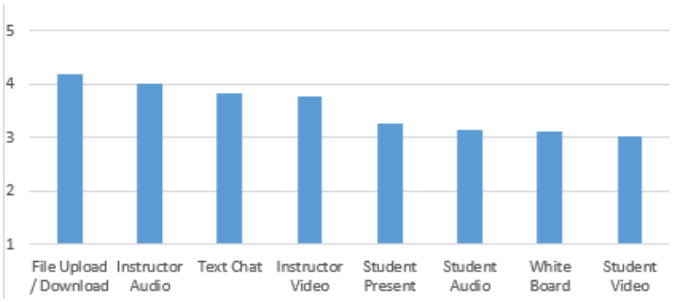


Figure 1: Importance of Synchronous Tools

## Discussion

Both the quantitative and qualitative results, whether considered individually, jointly, or in the context of theoretical perspectives, pointed to a desire for the same thing most students want from most courses of any type: clarity, organization, appropriate flexibility, and interaction with the professor and students. While students liked the flexibility online courses offer, they still expected basic attributes. To a large degree, the students participating in this survey did not believe they had received these basics in online courses. What does this say about the online environment and its tools? It indicates that as long as these basic attributes are absent, these attributes are what matter most.

## Conclusion

The authors conclude that basic features of online learning environments and associated tools are most important to students. Consideration of study findings within the context of educational theories of social presence and rapport suggest that basic features are an essential foundation that must precede, but will complement, development of social presence through both basic and advanced features. The authors are persuaded that student desires for online courses do not differ significantly from their desires for organization, clarity and clear communication in face-to-face courses, with this being especially true at the undergraduate level.

This study is limited in its application to larger populations. Quantitative results were derived from convenience samples within a single university. The mixed methods design fundamentally limits application to larger populations. A full accounting of study details is beyond the scope of this brief paper; consideration of a full paper is in progress. Nevertheless, as current students, the current authors find the outcomes to be sensible. The outcomes mirror the authors' personal experiences both as students and as teachers of online courses.

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# 3D Printing as a Tool for Teaching and Learning in STEaM Education

Jared Vanscoder
University of North Texas
Department of Learning Technologies
United States
Email jared@jaredvanscoder.com

**Abstract**: This paper discusses 3D printing technology and its implications to teaching and learning science, technology, engineering, art, and mathematics. 3D printing is a process of creating a three-dimensional solid object from a digital model. A resurgence of the hands-on approach to teaching and learning has created a demand for a solution that requires little knowledge of manufacturing processes, aids visualization through tangible representation, and speeds prototyping.

*Keywords:* visualization, Computer Aided Design (CAD), 3D Printing, constructivism, STEaM, embodied cognition, experiential learning, haptic

## Introduction

Student creation is a powerful representation of learning. Applying learned knowledge to problem solving and the creation of objects has been proven to deepen learning. Previously, courses that involved "hands-on" curriculum were considered to lead into low skill, low wage professions. Because of such, these vocational programs were replaced and fabrication shops were repurposed. However, there has been a resurgence of the hands-on approach to teaching and learning. 3D printing technology, now priced within reach of schools, has the potential to accelerate and democratize science, technology, engineering, art, and math (STEaM) education.

## Context

3D printing, also known as additive or desktop manufacturing, is a process of creating a three-dimensional solid object from a digital model. The process consists of virtually slicing a digital object into layers typically only microns thick. The printing device then applies material in layers according to the slice data. The result is a tangible recreation of a digital model. This technology enables users to move from mental concept, to digital model, to physical object in a rather short amount of time and with very little knowledge of manufacturing processes. A process known as rapid prototyping. Materials can include metal and paper, but are most commonly plastic.

Currently, several different technologies are available to support 3D printing. "One end of the technology spectrum involves expensive high-powered energy sources and complex scanning algorithms. The other end is focused on reducing the complexity and cost of a well-established process to bring the technology to the masses." (Campbell, Williams, Ivanova, & Garrett, 2011) With hardware costs now under $1000, 3D printing technology is available to institutions as tool for learning.

## Theoretical Framework

While opponents may describe 3D printing as an unnecessary luxury for education, there are several learning theories which support implementation and use. All of which focus on actively engaging learners through hands-on experimentation and investigation (Donohue & Richards, 2009).

The Experiential Learning Theory describes how experience is transformed into learning through a cycle of experiencing, reflecting, thinking and acting. "Knowledge results from the combination of grasping and

transforming experience" (Kolb & Bauback, 2011). The process of converting knowledge to create an artifact of learning is a well established assessment method. 3D printing facilitates the creation process.

Constructivism explains that individuals create meaning of the world through constructs, or ways we choose to create order from chaos. One specific construct used is haptic perception: the understanding of tangible objects from touch. This process helps associate abstract concepts with more concrete perceptions of reality. Allowing children to construct knowledge by building it, has been described as one of the best ways to learn (Druin, 2002). 3D printing facilitates the conversion of abstract concepts into tangible objects.

The Theory of Situated Cognition suggests that learning is naturally tied to authentic activity, context, and culture (Brown, Collins, & Duguid, 1989). "Research reveals that the way we think is a function of our body and our interactions with our environment" (Birchfield, Thornburg, Megowan-Romanowicz, Hatton, Mechtley, Dolgov, & Burleson, 2008). 3D printing fosters learning by doing.

## 3D printers in Education

Imagining the opportunities 3D printing can bring to STEaM education is exciting. Nearly all manufacturers of 3D printing market towards education to a degree, yet none have had the success of Bre Pettis, a former public school teacher and founder of MakerBot Industries. His company makes very low cost printer kits that can be assembled by the user, which appeals to education. Pettis has a vision for a synergistic relationship between education and desktop manufacturing: "With MakerBots, students participate in project-based learning that is experiential in nature and has real-world applications... MakerBotting engages students in the world around them, kindles a curiosity about how machines work, how objects fit together, and how the designers, architects, and inventors who build the products, spaces and technology in their lives have found solutions to a variety of design problems. Makerbotting has the potential to transform the way we think about Science, Technology, Engineering and Mathematics (STEM) education, and to inspire more young people to pursue STEM careers." MakerBot Industries has also developed and curates curriculum using their 3D printing products for use in classrooms.

The DeLaMare Science and Engineering Library at the University of Nevada is one of very few academic libraries to provide 3D scanning and printing to all students and faculty, as well as the public. The move is part of a plan by director Tod Colegrove to "transform the facility from a typical library that promotes knowledge through books to one that also encourages creative thought and discussion via hands-on technology." (Hildago, 2012)

## Value to STEaM Education

### 1. Science and Math

A common difficulty in science and math education is the inability of students to visualize abstract concepts. 3D printing allows anyone, specifically science or math teachers with little knowledge of manufacturing processes, to quickly and easily create tangible representations of abstract concepts for visualization such as molecular structure or mathematical models (Segerman, 2012) (Barsalou, 2008) (Bivall, Ainsworth, & Tibell, 2011). More advanced printing technologies are capable of printing biological material. Bioprinters construct living tissue by outputting layer-upon-layer of living cells. This capability could eliminate the need for using donor specimens in medical and drug research.

### 2. Technology

Another advancement in 3D printing technology is the capability to print working electrical circuitry directly into a part. Students can design and build fully functional electronic devices using simple circuit board design software and a printer with conductive ink. This allows for very quick prototyping of electronic devices, which is essential for inevitable mistakes from students.

### 3. Engineering

Advantages of using of 3D printing technology in engineering education are marginally distinguishable from that of industry; rapid prototyping being the leading attraction. Students are not required to have mastered

traditional manufacturing methods, such as machining, in order to produce a working solution. An engineering student at Massachusetts Institute of Technology says: "3D printing allows you to prototype rapidly and iterate quickly so it really levels the playing field in terms of design. Anyone with a program like Sketchup can design something without needing access to a machine shop or knowing how to operate fabrication equipment. I think it's creating a Renaissance in manufacturing and the design world because even the average person can use it." (Hildago, 2012)

**4. Art**

Finally, 3D printing technology can also be valuable in art education. Digital reproductions of sculptures can be made using 3d scanning technology. One specific application, AutoDesk 123D Catch, stitches photographs together to create a digital 3D model of an object. While ReconstructMe uses the depth-sensing camera in the Microsoft Kinect to create a point cloud: three dimensional data representing the surface of an object. Virtual models can be saved as digital files, distributed via the internet, and reproduced on a 3D printer allowing students access to art which might be located in locations across the globe. An additional benefit is for students to create a physical representation of digitally created sculptures.

## Conclusion

This paper has discussed 3D printing technology and its implications to teaching and learning science, technology, engineering, art, and mathematics. As costs continue to decrease, accessibility will increase, and the full potential of 3D printing technology will begin to be recognized. STEaM education will directly benefit from these advancements in tangible representation, rapid prototyping, and alternative materials.

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# The Digital Usage Gap: A Study on the Technology Proficiency of Community College Students

Heather Robinson
Department of Learning Technologies
University of North Texas
United States
heatherrobinson2@my.unt.edu

Christina Gilliam
Department of Learning Technologies
University of North Texas
United States
christinagilliam@my.unt.edu

**Abstract:** The original goal of the digital divide focused on providing access. While this goal is still relevant and critical, another area of concern has arisen within the subset of those with access. Access alone does not equate to digital literacy and thus, a digital usage gap has emerged. The confidence levels of the technology proficiency of community college students are essential to this research. The Technology Proficiency Self-Assessment (TPSA) questionnaire was administered to twenty community college students from two community colleges in Western and Central United States. The survey results indicate that the respondents are confident in using online resources to seek information and that the age of the student does not necessarily affect the level of confidence.

## Introduction

The digital usage gap, or digital divide, is a pertinent topic and research continues as the Internet and information technologies evolve. The term originated in 1996, coined by Lloyd Morrisett, who described the chasm that separates information technology into the "haves" and "have-nots" (Eubanks, 2011). According to Modarres (2011) a new world of digital differentiation is developing; an evolution from differential access to differential patterns of usage. "There is an ongoing consensus that simply being connected will not necessarily solve the potential sources of inequality" (Wei & Hindman, 2011, p. 218). The digital divide concerning network infrastructure and physical access to technology will continue to be a part of the equation, but as the Internet transforms and the way we access information changes, the digital usage gap will continue to grow. The Federal Communications Commission has considered a proposal to spend $200 million dollars to create digital literacy corps. These thousands of trainers would reach out to schools, parents, and job seekers to bridge the gap between access and efficient use of the Internet (Richtel, 2012). The efforts that focused on providing access to technology and infrastructure began before there was an understanding of the impact of the Internet and the resulting explosion of information. According to Modarres (2011), there has been more emphasis placed on providing technology and less on training.

## Literature Review

Fry (2009) discusses the characteristics of community college students and how their information-seeking skills are impacted. Some of these traits include "coming from the lower half of the high school classes, academically and socioeconomically," and "having lower academic ability and aspirations" (p. 40). Some students "information behaviors are often limited by their reading level, fear,

English as a second language, and experience as a first-generation college student" (p. 40). Research shows that in order for students to understand the importance of information-seeking and its impact, they must "develop an information need," which will, in turn give them the skills needed to know how to choose the appropriate materials or sources to help them make an informed decision and fulfill their quest for knowledge. If not taught the proper skills for seeking information, students can revert back to the information-seeking skills they possessed before college, which impacts how they evaluate and use what they find.

There is an assumption that once people go online, the issues of equality are no longer a concern. Hargittai focuses her studies by challenging this assumption by researching Internet information seekers' characteristics of use. This research is notable because it provides a better understanding of digital inequality and the motivators of those who have crossed to the "connected" side of the digital divide (Hargittai, 2010). A common misconception is that young adult computer users, or digital natives, are technology savvy. The importance of the Hargittai (2010) study is the data represented shows that variation exists when it comes to understanding certain aspects of Internet use (2010). The data presented in this study does not support the argument that digital natives are universally knowledgeable about the Web.

A study conducted by Tien & Fu (2006) focuses on two dimensions of the digital divide: computer use and computer knowledge. A research question posed by Tien & Fu (2006) that is central and relevant to this paper on the shift in the digital divide is: how do undergraduates perform in regard to computer knowledge and skills? 2,719 students completed the survey and it was discovered that most undergraduates perform at the middle to average level of computer knowledge (Tien & Fu, 2006). The study reveals that the digital divide (a form of social inequality) has influenced college student learning. The authors suggest more software courses be required for college freshmen.

Groce (2008) discusses the importance information literacy plays in searching for information. Many times, students' ability to seek information impacts their success. Groce (2008) states that for a student to be information literate, it "requires critical thinking and research skills as well as computer, technological, and library skills" (p. 192). She continues by stating that information literacy is essentially a collection of skills that enables learners to know when they need information, how to find it, understand it, and use it successfully. The author suggests providing ways for community college students to access information without feeling overwhelmed.

## Research Questions:

- How do community college students feel about using online resources to seek information?
    - Hypothesis: Community college students are not confident using online resources to seek information.
    - Null hypothesis: Community college students are confident using online resources to seek information.
- How do community college students over 30 feel about their technology proficiency skills?
    - Hypothesis: There is a difference in confidence levels between students under 30 and students over 30.
    - Null hypothesis: There is no difference in confidence levels between students under 30 and students over 30.

## Methods

Twenty community college students from two community colleges in Western and Central United States participated in this survey. The participants were asked to complete a survey that required five to ten minutes to complete. The participants were recruited through e-mail and were asked to complete the survey in Surveymonkey. Fourteen females and six males contributed responses to the study ($N$=20). The age of the participants ranges from 18 to 56, with an average age of 29.7. 75% of the participants reported receiving a high school diploma or GED as the highest degree received, with 25% reporting an

Associates degree is the highest degree received. 100% of participants reported having a computer and access to the World Wide Web at home.

The instrument used for this survey is The Technology Proficiency Self-Assessment (TPSA v.10), developed by Margaret Ropp in 1999. It was developed to reflect the domains that form the basis for the Michigan State University College of Education Technology Proficiency Checklist. It is a twenty item Likert-type instrument. It was designed to reflect four domains included in the International Technology in Education (ISTE) National educational technology standards for teachers. The content validity of the TPSA is very high due the way it was constructed using the performance standards of ISTE (Knezek, Christensen, Miyashita, & Ropp, 2000). The self-assessment contains twenty items, five each from the following domains of proficiency: 1). Electronic mail, 2). World Wide Web, 3). Integrated Applications, and 4). Integrating Technology into Teaching (Knezek, et al, 2000). Permission to use this survey was granted by the associate director of the Institute for the Integration of Technology into Teaching and Learning (IITTL).

The survey was recreated in Surveymonkey. Participants are asked to rate their level of confidence in their ability to perform the tasks listed on the instrument. The version of the survey used for this research uses 5-point Likert descriptors in a "strongly disagree" to "strongly agree" format. TPSA internal consistency reliability scale was found to have a reliability of alpha = .95. "In a more recent study, the entire instrument was found to have a reliability alpha of .94 from a set of responses from 506 in-service teachers. Alphas were also determined for each of the four subscales: Electronic mail (.78), WWW (.81), Integrated Applications (.84) and Teaching with Technology (.88)" (Knezek, et al, 2000).

The Technology Proficiency Self-Assessment (TPSA) is a measure of self-efficacy. The TPSA survey was originally developed to measure teacher confidence when using technology in education (Morales, Knezek, & Christensen, 2008). The survey was used to monitor technology integration competence of pre-service teachers. The data indicated that there was a low technology proficiency, which presented a challenge for student portfolio construction (Wang, 2009).

## Results

The results of the TPSA survey indicate that the participants are confident to highly confident on the tasks posed in the TPSA survey. The mean scores of fourteen of the eighteen questions posed regarding confidence level of performing a task were over $M$=4.0 on a $M$=5 point scale. Four questions scored in the $M$=3.0 to $M$=4.0 range (See Figure 1). For this survey, the level of significance is .05. The significance level of all questions on the one-sample t test is .000, $p<.05$ (See Figure 2). Scoring the TPSA survey also reveals a high confidence percentage from 80% to 93%. We fail to reject the null hypothesis that students are confident using online resources to seek information.

| Scoring the TPSA Survey | |
|---|---|
| Domain Subscale | Mean |
| Electronic Mail | 4.69 |
| World Wide Web | 4.414 |
| Integrated Applications | 4.0 |
| Integrated Technology into Teaching | 4.42 |

Independent t-tests were performed between Group 1 (participants under 30) and Group 2 (participants over 30) (See Figure 3). The question with the lowest mean (3.58) is: I feel confident that I could create my own World Wide Web page. This question was used to determine if there is a difference between the two groups. It was found that there is no significant difference between the two groups: Group 1 $t(-.302)=.766$, $p>.05$, and Group 2 $t(-.307)=.763$, $p>.05$. There is no statistically significant difference between the students under 30 and students over 30 in the confidence level to create a World Wide Web page. This was found to be true for all questions on the TPSA survey (See Figure 2). The effect size and practical significance is very small and not meaningful in this context, Cohen's $d= -0.142829005$. We fail to reject the null hypothesis that there is no difference in confidence levels between students under 30 and students over 30.

## Discussion

The hypotheses for this study are tested by the research that was conducted. The survey results indicate that the respondents are confident in using online resources to seek information and that the age of the student does not necessarily affect the level of confidence.

Limitations for this study include a potential for participation by respondents who are highly proficient in using online resources to seek information, a likelihood that respondents will answer the questions different to reflect a better result (self-efficacy), and there is a potential for misunderstanding what the question is asking (i.e., feeling confident that respondents can find primary sources and what that means in terms of research). Participants responded to an e-mail request to answer the survey. Gathering and recruiting subjects through face-to-face courses or non-electronic means may provide a better cross section of community college students. The survey also required completion in an online environment, which potentially skewed results in a positive fashion toward those more comfortable in the online environment. Low population size and a lack of time to recruit additional participants were also limitations in this study.

Some considerations for future research include nontraditional students and their perceptions of computer proficiency as compared to their traditional counterparts as well as how prepared they are to search for information using multiple resources such as online databases, print materials, and quality Internet sites. A second consideration is how libraries and librarians can help nontraditional students use the library to conduct research. A third consideration is how the characteristics and lifestyles of nontraditional students impact their success in information seeking skills and completion of their education.

The 'changeable' characteristics of attitudes toward computers and technology, computer anxiety, and computer self-efficacy, technology proficiency, and computer coping strategies might be useful as benchmarks for learning distinguished from characteristics that are relatively resistant to learning" (Ropp, 1999, p. 404). The TPSA was developed to measure individuals' characteristics and stimulate reflection by the individual on desired proficiencies (Ropp, 1999). Self-efficacy is the process by which individuals evaluate their capabilities, strengths, weaknesses and generate self-appraisals of capability. Computer self-efficacy represents the "essential elements of self-efficacy as applied to computer learning" (Ropp, 1999, p. 405).

Data based on self-evaluation is considered subjective and many not accurately reflect the user's real level of computer knowledge (Tien & Fu, 2006). Many individuals overestimate ability and underestimate weaknesses. The TPSA questionnaire belongs in the self-efficacy category, and is a survey which measures one's confidence in the competence of certain tasks (Morales, Knezek, & Christensen, 2008).

While college students have a high subjective confidence in their ability to generally execute information seeking behavior on the Internet, the study indicates that such general confidence does not necessarily translate into confidence when such claims are tested concerning use of integrated application, or the use of software to solve a task. Further testing may determine if the participants' general

confidence in their broad use of e-mail and the World Wide Web is compromised by specific testing of that confidence, such as the specific tasks in the Integrated Applications questions of the TPSA survey. The purpose is to determine if the students' confidence levels would drop if specific tasks or problems were outlined in the areas of e-mail and World Wide Web use. To create an educational environment where students emerge with the tools necessary to achieve a competitive edge, we should evaluate the baseline educational requirements in the area of Internet use and information seeking. This will allow our students to become competent and empower our community and individuals to be relevant participants in the world of technology - where so much will occur in the future.

Access does not guarantee the efficient use of computers; "the use of computers does not necessarily lead the users to have adequate knowledge and skills to operate computers" (Tien & Fu, 2008, p. 422). The shift in the digital divide is not a change of the focus of access to technology. Access to technology and network infrastructure will continue to be researched. The shift is a change in the study of the side effects of the original digital divide. It is very well the first shift, but will not be the only shift associated with this topic. As the Internet continues to expand, additional side effects of the digital divide will continue to develop. Focused research should continue on these side effects and how curriculum can progress in higher education to prepare and accommodate.

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