The purpose of the Online Learning Consortium (OLC) is to help learning organizations continually improve the quality, scale, and breadth of online programs according to their own distinctive missions, so that education will become a part of everyday life, accessible and affordable for anyone, anywhere, at any time, in a wide variety of disciplines.

This publication contains information obtained from authentic and highly regarded sources. Reprinted material is quoted with permission, and sources are indicated. A wide variety of references are listed. Reasonable efforts have been made to publish reliable data and information, but the authors and the publisher cannot assume responsibility for the validity of all materials or the consequences of their use.

Attributions should be made with a full citation including the link to the article or issue available by search at the *Online Learning* webpage, http://onlinelearningconsortium.org/publications/olj_main. Please direct all inquiries to olj@onlinelearning-c.org.

To learn more about submission guidelines for authors and subscription information, please visit: http://onlinelearningconsortium.org/publications/olj_guidelines.

Publications assistants:

Michael Mastroianni, Damien Bilka: Copyeditors

Beth Meigs: Layout Editor

Printed in the United States of America 0 9 8 7 6 5 4 3 2 1

Standard Book Number 978-1-934505-11-3-1-934505-11-0 (print) International Standard

Book Number 978-1-934505-12-0-1-934505-12-9 (online)

The Online Learning Consortium, Inc. is a consortium of higher-education providers sharing the common bonds of understanding, supporting and delivering education via asynchronous learning networks (ALNs). With the mission of providing learning to anyone anywhere, OLC seeks to provide new levels of learning capability to people seeking higher and continuing education. For more information about OLC please visit: http://onlinelearningconsortium.org.

Online Learning

Volume 19 Issue 5 – December 2015

Table of Contents

SECTION I: K-12 Online Learning Research

Introduction

Within the past four years all 50 states and the District of Columbia have developed significant online learning opportunities for K-12 students (Watson, Murin, Vashaw, Gemin, & Rapp, 2013). K-12 online student enrollments in the US have grown from approximately 40,000 to more than four million in a period of fifteen years (Ambient Insights, 2011; Clark, 2001). Similar growth has occurred internationally, particularly in Australia, Canada, New Zealand, and several Asian nations (Barbour, 2014; Barbour, Brown, Hasler Waters, Hoey, Hunt, Kennedy, Ounsworth, Powell, & Trimm, 2011). While there is a developing body of research that supports the practice of K-12 online learning, most scholars agree that practice is out-pacing the availability of useful research (Barbour & Reeves, 2009; Cavanaugh, Barbour, & Clark, 2009; Hill, Wiley, Nelson, & Han, 2004; Rice, 2006).

While at an admittedly slower rate than the growth in enrollments, research in K-12 online learning has been picking up pace in the past decade and a foundation in best practice is now being laid. Still, state and national policy makers, online charter school management companies, and various advocacy organizations continue to push forward with innovative practices that lack an empirical basis. The consequences of non-reflective policy making and practice that omits the value of constructive criticism based on empirical evidence has an unsettling impact on learners. Most recently, the Center for Research on Education Outcomes (CREDO) at Stanford University published a national report investigating the outcomes of 158 full-time online schools across 17 states. The study found that the majority of K-12 online charter school students severely lacked academic gains in math and reading as compared to their counterparts in brick-and-mortar schools (CREDO, 2015). While experts hope virtual school leadership will internalize these results and seek evidence of effective practice, previous studies have not made noticeable impact on these contexts (Center for Research on Education Outcomes, 2011; Colorado Department of Education, 2006; Hubbard & Mitchell, 2011; Innovation Ohio, 2011; Joint Legislative Audit Committee, 2010; Miron & Urschel, 2012; Office of the Legislative Auditor, 2011; Ryman & Kossan, 2011; Zimmer et al., 2009).

This is not to say that K-12 online learning does not hold promise as an effective mode of instruction. However, it does call for responsible innovation practices that are reflective and data-driven. Additionally, it is not enough to study what does not work in K-12 online settings, but we - as experts - must also investigate and report instances of effective policy and practice in K-12 online and surrounding settings such as K-12 blended classrooms or online learning for non-K-12 students. These investigations test and narrow down promising practices that may serve K-12 online learners in the future. A special K-12 issue of *Online Learning* is an ideal avenue for such academic dialogue. The focus of this special issue of *Online Learning* is to present rigorous research specific to the context of K-12 education including systematic inquiry into promising practices, various schooling models, measures of quality, and parent and teacher experience. All authors have provided explanations of K-12-specific terminology to support readers new to K-12.

Special Issue Articles

Since *Online Learning* has not historically facilitated discourse between the online learning experts of K-12 and those in higher education, this issue begins with an expert's view of the field in K-12 online learning. Poureau's interview with Dr. Joe Freidhoff, the Executive Director of the Michigan Virtual Learning Research Institute. He introduces readers to what is currently understood in the body of literature and where research needs to head to have an impact on K-12 learners. This piece will be especially valuable to experts in the field of online learning in settings beyond the K-12 sector.

Our next piece by Rice and Carter presents qualitative results that expand on the roles and challenges of K-12 online educators, administrators, and support staff who serve students with disabilities in the online setting. To further inform best practice in serving K-12 learners who need additional interventions, Chappell, Arnold, Nummery, and Grant conducted a quasi-experimental study to investigate the impact of an online math tutoring support service for middle school students.

In rural environments, K-12 schools may depend on online programs to open opportunities to new courses. In Barbour's case study, he illuminates how one school in Canada used synchronous distance education to effectively engage groups of students in local learning communities. Borup, Stevens, and Hasler Waters also investigated effective practice in the high school setting. They interviewed parents of online high school students to better understand parental engagement behaviors and obstacles to effective parental engagement.

Two new texts in the field were also released and worthy of review. Mayse provides an account of the *Handbook of Research on K-12 Online and Blended Learning* edited by Ferdig and Kennedy. As a comprehensive open resource, this text holds promise to impact the field as a seminal read. Equally promising, Rycroft offers a review of *Online, Blended, and Distance Education: Building Successful Programs in Schools*, which was edited by Clark and Barbour.

From this special issue, *Online Learning* readers who are unfamiliar with the K-12 setting should take away a new understanding of the connections and commonalities of online learning in their own contexts and in the K-12 environment. While K-12 online learning is influenced by a fluctuating socio-political context, and the complexities of our younger learners, there is much to be learned and shared across settings. Those readers currently engaged with the K-12 online learning setting should take away the new promising practices presented in the special issue, and consider *Online Learning* as a new venue for academic discourse in our field.

Regular Issue Articles

As a re-branded journal that has recently merged with *Journal of Online Learning and Teaching*, there is a need to include articles in this issue that were not submitted to this special issue of *Online Learning*. The first of these articles by Scott, Temple, and Marshall serves as a bridge in this issue between the K-12 setting and higher education. In a special education teacher preparation course that was designed for the online setting using Universal Design for Learning principles, these authors found that participants in three different course sections perceived the course had positively impacted their preparation.

The issue of online learner readiness affects online learning outcomes, which is true in both graduate teacher education and undergraduate online learning. To better predict the readiness of first year undergraduate online learners, Yu and Richardson sought to test the validity and reliability of the Student Online Learning Readiness (SOLR) Instrument using an exploratory factor analysis. In this article, the authors found the instrument to be valid and reliable and make recommendations for use of instrument results, which could contribute to planning support structures.

To further support the process of planning, Picciano presents a systems model for planning college or university-level online programs. This systems model takes into account hardware, software, faculty development, infrastructure, finances, and policies. University administrators may find Richardson's description useful in planning and evaluation processes.

Our last piece in this issue by Ruby, Perna, Boruch, and Wang revisits massive open online course (MOOC) evaluation practices. These authors use sixteen University of Pennsylvania Coursera

MOOCs to apply measures of social media engagement to measure and compare learner engagement with course content. The authors suggest such measures can guide targeted instructional improvements in MOOCs.

With this issue, it is clear that *Online Learning* as a title and common theme suits the historic roots of this publication by merging the legacies of the *Journal of Asynchronous Learning Networks* and the *Journal of Online Learning and Teaching*, while inviting the growing K-12 online community. *Online Learning* promises to be an influential center of academic discourse.

Anissa Lokey-Vega and Michael K. Barbour - Guest Editors

References

Barbour, M. K., Brown, R., Hasler Waters, L., Hoey, R., Hunt, J., Kennedy, K., Ounsworth, C., Powell, A., & Trimm, T. (2011). *Online and blended learning: A survey of policy and practice from K-12 schools around the world*. Vienna, VA: International Association for K-12 Online Learning.

Center for Research on Education Outcomes (2011). *Charter school performance in Pennsylvania*. Stanford,CA: Author. Retrieved from http://credo.stanford.edu/reports/PA%20State%20Report_20110404_FINAL.pdf

Center for Research on Education Outcomes (2015). *Online charter school study*. Stanford, CA: Author. Retrieved from https://credo.stanford.edu/pdfs/Online%20Charter%20Study%20Final.pdfColorado Department of Education (2006). *Report of the State Auditor: Online education*. Denver, CO: Author. Retrieved from http://www.cde.state.co.us/onlinelearning/download/2006%20Report%20of%20the%20State%20Auditor.pdf

Hubbard, B. & Mitchell, N. (2011). Online K-12 schools failing students but keeping tax dollars. *I-News Network*. Retrieved from http://www.inewsnetwork.org/special-reports/online-k-12-schools/

Innovation Ohio (2011). *Ohio e-schools: Funding failure; Coddling contributors*. Columbus, OH: Author. Retrieved from http://innovationohio.org/2011/05/12/ohio-e-schools-funding-failure-coddling-contributors-2/

Joint Legislative Audit Committee (2010). *An evaluation: Virtual charter schools*. Madison, WI: Legislative Audit Bureau. Retrieved from http://legis.wisconsin.gov/lab/reports/10-3full.pdf

Miron, G., & Urschel, J. (2012). *Understanding and improving full-time virtual schools*. Denver, CO: National Education Policy Center. Retrieved from http://nepc.colorado.edu/publication/understanding-improving-virtual

Office of the Legislative Auditor (2011). *K-12 online learning*. St. Paul, MN: Author. Retrieved from http://www.auditor.leg.state.mn.us/ped/2011/k12oll.htm

Ryman, A., & Kossan, P. (2011). The race to online: Arizona experiments with virtual K-12 schools. Will they work for your child? *Arizona Republic*. Retrieved from http://www.azcentral.com/news/education/online-school/

Zimmer, R., Gill, B., Booker, K., Lavertu, S., Sass, T. R., & Witte, J. (2009). *Charter schools in eight states effects on achievement, attainment, integration, and competition*. Santa Monica, CA: RAND Corporation. Retrieved from http://www.rand.org/content/dam/rand/pubs/monographs/2009/RAND_MG869.sum.pdf

Interview With Joe Freidhoff: A Bird's-Eye View of K-12 Online Learning

Leslie Pourreau
Kennesaw State University

Welcome to the interview portion of this special issue of the OLC *Online Learning* journal. Our intent is to introduce our long-time *Online Learning* readership to the field of K-12 online learning while also providing direction for our K-12 online learning scholars about where the field is going or should be going in terms of meeting the needs of K-12 stakeholders. We recently sat down with Dr. Joe Freidhoff, executive director of the Michigan Virtual Learning Research Institute, and asked him to provide us with his perspective on this ever-changing field.

What can you tell us about your background and your position at the Michigan Virtual Learning Research Institute?

My background is in English education. I taught high school English for three years in a local public school and a charter school before going to graduate school. I attended Michigan State University and earned a PhD in educational psychology and educational technology. During my time there, I gained teaching experience at the undergraduate and graduate levels in face-to-face and online settings. In 2009 after graduating from Michigan State, I began working at Michigan Virtual University. MVU is a private, nonprofit organization that works to advance K-12 education through digital learning, research, innovation, policy, and partnerships. I have worked in various capacities at MVU and currently serve as the executive director of the Michigan Virtual Learning Research Institute, which is housed at MVU. Our institute seeks to conduct research to better inform policy and practice aimed at improving the performance of students engaged in K-12 online and blended learning. The aim is to gain a richer, more contextualized understanding of what is happening in Michigan. We work to take what happens in the state of Michigan with K-12 online learning and promote its applicability to a greater context through connections with colleagues across the country and around the world. Earlier this year, we released our second annual report detailing the effectiveness of K-12 online learning in Michigan (Freidhoff, 2015). In addition to authoring this report, I present report highlights at state and national conferences, to key educational organizations, and to the Michigan legislature.

For those new to K-12 online learning, could you define the scope of the field?

Our field has grown immensely in the last decade. For me, K-12 online learning involves a myriad of places, pedagogies, professional learning, and policy. Places have a variety of meanings given that K-12 online learning looks different from state to state as well as within a state. Some states have full-time public schools where students can receive 100% of their instruction online. Some have supplemental state-supported virtual schools where students enroll in their local brick-and-mortar school but also may take online courses provided by the virtual school as part of their course schedule. Some

states have both. Sometimes students take online courses at their local school building, and sometimes they engage in online learning away from campus. The history of K-12 online learning mostly has centered on high school and, to a degree, middle school, and predominantly for supplemental contexts. As full-time options have become more available, the K-6 and K-8 enrollments have started to increase. These are just a few examples of how place plays out in K-12.

K-12 online learning also looks at how students learn and are taught in online environments. From course design aspects to content-specific pedagogies, the field works to better understand how to efficiently and effectively design and deliver high-quality instruction to students. This has tended to include work around personalized learning and competency-based education. The interaction of technology, pedagogy, and content has necessitated professional learning for teachers and other school staff who work to support online learners and online learning programs.

On the policy side, frequent state issues include teacher credentialing and reciprocity, the number and size of full-time statewide cyber schools, funding models for online learning, and a student's right to choose online courses—often referred to as course choice or course access. Each state views these issues differently, which results in a differentiated set of rules and requirements across the United States. Districts also have their own sets of policies governing online learning and learners. These policies, both state and local, shift constantly, making it a career just to keep up with this area of K-12 online learning.

If you were to recommend three or four seminal pieces in the field, what would they be and why are these so important to the field?

Cathy Cavanaugh was the lead author on two meta-analyses from the early 2000s that compared K-12 distance and online learning with traditional K-12 schooling (Cavanaugh, 2001; Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004). These works were seminal in that they provided evidence that online or distance delivery methods could be as effective as traditional methods for K-12 students. While both works provided validation to the field, they also presented a challenge: The number of existing studies was and still remains small, and little was known about why or under what conditions K-12 students succeeded or failed when they moved into online environments.

In the mid-2000s, Kerry Rice (2006) published a comprehensive literature review on K-12 distance education that addressed the aforementioned comparison studies and field policy while also delving into areas such as learner characteristics, learner supports, and the affective domain. It remains a good primer on the challenges and opportunities that K-12 online research offers.

My third recommendation groups together several publications under the heading of iNACOL-related works. iNACOL is the International Association for K-12 Online Learning and is one of the key trade organizations in this field. iNACOL publishes reports that are important to K-12 online learning in that they identify trends and directions for the field by covering topics such as access and equity, at-risk learners and online education, national standards, blended programs, quality assurance, and competency-based education. One example of an iNACOL-related work is the *Keeping Pace* report released yearly at the annual iNACOL conference by John Watson and his Evergreen Education Group. Although not an iNACOL publication, this report is one of the most heavily cited pieces in our field, especially when it comes to documenting the size and growth of K-12 online learning. It provides state-by-state profiles, updated on an annual basis, and identifies key trends in the field of K-12 online learning. *Keeping Pace* has documented much of the history of K-12 online learning; it will release its 12th edition in November 2015.

Lastly, recent publications like Rick Ferdig and Kathryn Kennedy's (eds.) *Handbook of Research on K-12 Online and Blended Learning* and Tom Clark and Michael Barbour's (eds.) *Online, Blended, and Distance Education in Schools: Building Successful Programs* have addressed a range of K-12 online

learning topics by bringing together in one collection key works written by a who's who of key researchers. Additionally, the Michigan Virtual Learning Research Institute maintains the Research Clearinghouse for K-12 Blended and Online Learning (http://k12onlineresearch.org), where interested readers can find many more publications from the field of K-12 online learning.

Considering research in K-12 online learning, what can we say we know about the field?

K-12 online enrollment has increased dramatically over the last decade. Michigan went from about 185,000 online enrollments in 2012–13 to over 319,000 one year later. Nationally, there is likely a total of 5,000,000–7,000,000 online enrollments in full-time and supplemental programs combined, if not more. K-12 online learning is growing at a rate that clearly outpaces the research we have about it. I think language from a recent Institute of Education Sciences grant (U.S. Department of Education, 2015) sums up the research need quite succinctly:

> Given the omnipresence of technology in modern life, it may be that the most pertinent research questions have less to do with the effectiveness of online and blended learning relative to traditional (i.e., nontechnological) modes of instruction and more to do with understanding how to improve delivery so that more students derive greater benefit. (p. 11)

The idea of improving delivery to increase student benefit is so vital, since students enroll in online courses for a variety of reasons ranging from face-to-face course scheduling conflicts to retaking courses in an online format to recover credits from failing grades. We know that students who take online courses to resolve scheduling or unavailability issues with face-to-face courses tend to have higher pass rates than students who enroll in online courses out of learner preference and credit recovery, yet the students who struggle in face-to-face courses tend to be viewed as the prime candidates for online learning. In my mind, there is a disconnect between what we know and what we practice. We know that online students tend to be more successful when they have strong time management skills, know how to set goals, have regular attendance, and enter a course having a solid foundation in the prerequisite knowledge, skills, and attitudes of the subject, et cetera—traits similar to successful face-to-face learners. The challenge is that schools often enroll online students who have significant weaknesses in one or more of these areas, so the learner traits we directly relate to high success are not necessarily those of the students typically being enrolled.

We know online learning can work. Many programs succeed by combining disciplined student selection and preparation with systems of local support, engaging parents in the online learning process, and choosing or creating high-quality course content taught by skilled online learning instructors; however, we can also point to many programs that fail despite using these same combinations. A key challenge for K-12 online learning researchers is to effectively tease out the traits of successful programs for replication with fidelity at other institutions.

Finally, we know that teacher preparation programs do not adequately prepare teachers to teach in online environments, and very few offer preservice practicum teaching experiences housed in fully online environments. Clearly, high-quality teachers are one of the key leverage points for improving online delivery, and we need more research and better training for those who teach online.

What challenges do K-12 online learning scholars face?

Many researchers in our field are faculty at institutions of higher education who must navigate the tenure and promotion process, which includes publishing. Most publications end up in highly-ranked, peer-reviewed journals, many of which do not offer open access. A challenge facing all researchers is publishing high-quality research that is accessible and applicable by K-12 online learning practitioners. We need to help practitioners steer the students best suited for online learning and also help them create

educational systems that afford students the most applicable and appropriate support systems for their learning needs and contexts. Doing this involves reducing the amount of time it takes to move from theory into practice given the large number of students being educated through online learning. Researchers need to use more widely accessible forums to expand the theories and knowledge of our research base in the field. Publishing in open journals such as this one would be a start.

Our field is one of big data and rich description. We increasingly capture an abundance of metadata about student interactions and pathways through the learning management systems that deliver online courses, but there are critical data points that go uncaptured and will remain uncaptured by these systems. The challenge here for scholars lies in developing proficiency in mixed methods approaches to research. Developing the skill set to analyze millions of data points competently while simultaneously providing rich, qualitative analysis of the off-line contexts and the online interactions takes time and a commitment to ongoing professional development.

In this same vein, another challenge for scholars in our field is developing relationships with researchers from other disciplines, including those who focus on online learning and adults, or online learning and higher education. Developing more interdisciplinary research teams will benefit our field and others by generating new questions, applying new methods, discovering new insights, and guarding against group thinking.

The central challenge we have as K-12 online learning researchers is improving student learning. We need research that moves us closer to the potential that online learning advocates proclaim. Proponents see online learning as a way to bring highly skilled teachers to students so that zip codes cease to define educational opportunities, a way to educate students anytime and anywhere. We need research to help make that a reality. Despite notions of anytime–anywhere learning, time and routine are critical factors in student success, and the location and settings in which they work matter. We need more research to better inform time-and-place decisions. I mentioned earlier that online learning is seen as having the potential to help students recover credits which they have failed, but it also is expected to help close the gaps for low-income students. In Michigan last year, 64% of the K-12 online enrollments came from students in poverty, but only 53% of them were successfully completed. We need more research on better serving at-risk populations, who make up a large percentage of current online learning students.

Where do you see K-12 online learning in 20 years, and how should research help shape this vision?

I doubt I have a good vision of what technologies are going to exist in 10 years let alone 20, but I'm willing to speculate. Today, I think schools, students, and parents turn to online learning when something goes wrong with the traditional model—a course the student wants to take is not offered at the school, the student can't take the course at the hour it is offered, or the student has fallen behind and needs to make up the credit. To that extent, I think we are still at the stage where K-12 online learning occurs at the fringe.

Over the next 20 years, preferably much sooner, I think schools—some because of educational beliefs and others because of parent and student pressure—will integrate online learning as one of multiple flexible-learning options provided to best serve the needs of diverse student populations. Many "traditional" courses will blend substantial online content into their delivery, and schools will continue to offer à la carte versions of online courses to supplement local offerings. Full-time online schools will continue to grow and educate significant numbers of students, but the majority of students who participate in online learning will do so in a supplementary manner. I think we will have moved beyond the face-to-face versus online learning mindset and will be talking more about how the two complement rather than compete against each other.

In twenty years, I believe that longitudinal data systems at the local and state levels will be better; I doubt this will happen at the national level. Statewide systems will provide much richer detail and

greater transparency of outcomes. We will have more advanced early warning and ongoing monitoring systems that will allow for quick intervention to better ensure student success in a course.

Researchers will play a vital role in shaping the future of K-12 online learning. A considerable threat to the vision I laid out is that well-intentioned schools frequently enact poorly designed online learning programs. The experiences of those impacted by such programs—school administrators, teachers, students, and parents—confirm or create beliefs that online learning doesn't work, even if counterparts in other schools are proving otherwise. We have a significant research need to expand our understanding of how to create highly successful online learning programs, how to communicate this understanding in ways that influence K-12 schools' program designs, and how to bring these kinds of programs to scale. Researchers help shape the kinds of conversation that take place as well as who participates in them. The research that we as a field conduct must help audiences that include course designers, school administrators, school teachers, on-site facilitators, students, parents, and policy makers take action to improve current efforts so that the reality of what online learning offers comes closer to meeting its potential.

Correspondence: Leslie Pourreau is a doctoral candidate in the Department of Instructional Technology at Kennesaw State University, in Kennesaw, Georgia. She has written and presented about subjects such as K-12 female educator identity and change, technology and empowerment, and online professional development in virtual school settings. She can be reached at lap6562@kennesaw.edu or pourreaul@gmail.com.

References

Cavanaugh, C. (2001). The effectiveness of interactive distance learning technologies in K-12 learning: A meta-analysis. *International Journal of Educational Telecommunications, 7*(1), 73–78.

Cavanaugh, C., Gillan, K. J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The effects of distance education on K-12 student outcomes: A meta-analysis*. Naperville, IL: Learning Point Associates. Retrieved from http://faculty.education.ufl.edu/cathycavanaugh/docs/EffectsDLonK-12Students1.pdf

Clark, T., & Barbour, M. K. (Eds.). (2015). *Online, blended and distance education in schools: Building successful programs.* Sterling, VA: Stylus Publishing.

Ferdig, R. E., & Kennedy, K. (Eds.). (2014). *Handbook of research on K-12 online and blended learning.* ETC Press. Available under Public License from http://press.etc.cmu.edu/content/handbook-research-k-12-online-and-blended-learning-0

Freidhoff, J. R. (2015). *Michigan's K-12 virtual learning effectiveness report 2013-14*. Lansing, MI: Michigan Virtual University. Retrieved from http://media.mivu.org/institute/pdf/er_2014.pdf

Rice, K. L. (2006). A comprehensive look at distance education in the K-12 context. *Journal of Research on Technology in Education, 38*(4), 427–449. Retrieved from http://www.eric.ed.gov/PDFS/EJ768723.pdf

U.S. Department of Education, Institute of Education Sciences. (2015). *Request for applications: Education research and development center program* (CFDA Publication No. 84.305C). Retrieved from http://ies.ed.gov/funding/pdf/2016_84305C.pdf

"When We Talk About Compliance, It's Because We Lived It" Online Educators' Roles in Supporting Students with Disabilities

Mary Frances Rice
University of Kansas

Richard Allen Carter, Jr.
University of Kansas

Abstract

As participation in online learning grows, so do concerns around the ways in which students with disabilities are served in virtual school programs, both full and part-time. At the crux of this struggle is the way in which federal and state laws (many of which were incepted before online learning existed or gained traction as an educational option) are interpreted by educators and translated into policies at the school level. Further, administrators, special education case managers, and teachers all interpret school level policies and answer to directives from a hierarchy of supervisors. The interpretations of these policies and the understandings educators use to guide their thinking have not been well-researched. In the present study, teachers, special education case managers, school level special education administrators, and regional directors were interviewed about their roles in developing, supporting, and implementing accommodations and other forms of support for students with disabilities in online courses. Findings from this work focus on the role conceptions of various types of educators in virtual schools and the tensions they experience as they work to support each other in positioning students with disabilities for success.

Introduction

For K-12 students with disabilities (SWD), there has been a marked shift from participation in school programs towards accountability for learning (Kaufman & Blewett, 2012; Zirkel, 2013). An emphasis on accountability has introduced terms such as *data-driven decision-making* (Mandinach, 2012) and *mastery learning* (Gillespie & Graham, 2014) into the school reform lexicon with particular implications for SWD. One implication is the need for SWD to be held to the same academic standards as

their peers without disabilities while also ensuring SWD have legally protected means of demonstrating subject mastery using modifications, accommodations, and other types of support (IDEA, 1997; IDEIA, 2004). Most support mechanisms pre-date online learning (receiving instruction partially or completely through synchronous or asynchronous interactions over the Internet) as a possibility in K-12 education. However, as more states mandate online learning for graduation, and as online schools increase in number, there are many questions about how accommodations for SWD are implemented (see Watson, Murin, Vashaw, Gemin, & Rapp, 2013). One question is how educators (at various levels) in online schools describe their roles and responsibilities in ensuring that disability service plans are implemented.

In the present study, teachers, special education case managers, school level special education administrators, and regional directors were interviewed about their roles in developing, supporting, and implementing accommodations and other forms of support for SWDs in online courses.

Providing Services to SWD

Accommodations, modifications, and other services to SWD are legally protected when included in a highly structured Individualized Education Plan (IEP) or a more flexible plan created under Section 504 of the Disabilities Rehabilitation Act of 1973. According to the federal Individuals with Disabilities in Education Act (1997), an IEP is:

> [A] statement of measurable annual goals, including academic and functional goals designed to meet the child's needs that result from the child's disability to enable the child to be involved in and make progress in the general education curriculum; and meet each of the child's other educational needs that result from the child's disabilities. (Sections 300.320(a)(2)(i)(A) and (B))

A team consisting of a child's teachers, parents or guardians, local school educational authorities, relevant central office personnel, and related service providers (e.g., speech therapists) create the IEP. A representative of the Local Educational Authority (LEA) attests that the stipulated support fits within the Individuals with Disabilities in Education Act's (IDEA) parameters. In addition, students are guaranteed a "free and appropriate public education" by public law 94-142 (1975), which was designed to give states and local schools guidelines and support that would ensure SWDs were able to attend school, be appropriately educated, and stipulates parental rights to advocate. Plans made under Section 504 outline support and accommodations for exceptionalities that fall outside of IDEA's guidelines. Developing these plans is not the responsibility of special education departments, but instead falls to parents, administrators and other legally relevant parties. Section 504 is part of general anti-discrimination laws that apply to all students, regardless of disability status.

Educators often have a weak understanding of how to incorporate students' actual needs as they create IEPs and plans under Section 504 (Mellard, Deshler, & Barth, 2004; Crawford & Ketterlin-Geller, 2013; Fuchs & Fuchs, 2001; Ketterlin-Geller, Alonzo, Braun-Monegan, & Tindall, 2007). In addition, there is minimal research on how educators view their responsibilities for implementing IEPs and 504 plans in various educational settings. This lacuna is prevalent in online educational settings where students do not regularly visit a physical institution to receive educational or other disability-related services. While McLeskey (2011) identified a high level of need for professional development regarding the creation and implementation of disability service plans, he did not address what participating teachers viewed as their roles in the process, how supervisors and administrators implicitly or explicitly shaped those roles, and there was no mention of how other educators who do not participate in the plan development work to the implement plans.

Concerns about educators' interconnected roles and responsibilities are especially pressing in K-12 online educational leadership arenas. When LaFrance and Beck (2014) reviewed administrative

preparation programs they found that very few provide administrator preparation for leading a K-12 online school, or for supporting online teachers and thus, most leadership "training" in online school contexts is gained "on the job" and through experience. In addition, several studies have documented a lack of awareness regarding the proliferation and popularity of K-12 online learning, the ways in which educators and the general public misconceive online and distance learning, substantial variability in quality, and ineffective or non-existent evaluation/accountability for student learning (Compton, Davis, & Mackey, 2009; Davis & Rose, 2007; Glass & Welner, 2011). These concerns about online learning are rooted in responsible and responsive virtual/online school leadership and not limited to teachers. These previously unconsidered questions of roles, responsibilities, and relationships in virtual/online schools urged and drove this research.

Role Construction in Professional and Educational Settings

The history of American schools is often linked to and characterized by local control. Often, this has resulted in considerable social and political tension (Apple, 2004). In his classic sociological look at teaching, Waller (1932) famously noted that schools strive for autocracy (i.e., isolation and self-governance) because they are under threat of criticism and sanction, and that they are under threat of criticism and sanction because they strive for autocracy. The tension, and even strain, that develops as a result of the need for schools to protect themselves from outside criticism falls to all educators within a given school, according to Waller. Although Waller's work is over 80 years old, there has been renewed interest in how his ideas relate to current reforms in education (Pajak, 2012).

Waller's (1932) view of schools has implications for how individuals in schools attend to their roles in institutions because his work suggests that strain on an organization causes uncertainty that will lead to particular kinds of responses from individuals. Jackson (1968) observed that people know when they are in the presence of an institution—all of their senses tell them so. Schools, in whatever incarnation, are likely to have a certain look and feel to them that gives them stability over time, but this also means that substantial and enduring change is difficult to accomplish. While online learning environments have fewer physical edifices, it is interesting to consider what aspects of school under these circumstances might transcend space and time to appear and reappear in various online schools.

It is under these conditions that individuals in online/virtual schools are striving to engage in the information gathering processes necessary to perform their roles. Goffman (1959) conducted work in identity that has been applied in highly technological environments because he emphasized technology as a shaping force in communication, which in turn, enables various roles to emerge (Bullingham & Vasconcelos, 2013). When individuals gather information about each other face-to-face or through technological media, they need to define the present social situation so that they can infer expected behavior. Sources of information are *sign vehicles* that allow individuals to *give* and *give off* impressions about themselves (Goffman, pg. 136). These sign vehicles take shape through what people do, what they say, how they say it, where they are when they say it, or vice versa by not saying or doing anything.

The process of information gathering for the purpose of knowing how to behave with others is crucial in professional settings where individuals must interact, including collaborating to serve SWD. The cycles of signal giving and receiving culminate in a *modus viviendi* (Goffman, 1959) or pattern of consensus for behavior in a setting. Goffman offers insight into how online educators might conceptualize their own roles in relationship to SWD, as the sign vehicles of technology influence the messages that form the pattern of consensus in their schools. Thus, educators who are intimately connected with the disability service plans not only determine what support will be given to SWD and what accommodations will be made, they also have the potential to dictate how that support becomes (or does not become) part of the *modus viviendi* at the schools.

Goffman's (1959) theories suggest that roles will be developed as educators interact with one another, even though the students in online schools may not physically meet. These interactions are not only limited to online schools, but also involve the brick-and-mortar schools which perform any number of functions, such as drafting the original IEP or 504 documents, providing certain services or therapies, maintaining student records for state reporting, and counseling the students regarding online course enrollment. Thus, a complex web of relationships emerges as SWD enroll, attend, and complete or fail online coursework.

Methods and Strategies

The participants in this study were 26 employees at online schools from 27 states. Six were male and 20 were female. Some employees worked in the same schools in the same states, while others were multi-school directors representing multiple states. These participants were identified through contacts with administrators responsible for overseeing research projects at large public online schools, through relationships with online learning vendors, and through charter school networks which provided the names of potential employee participants. Referred employees were contacted to verify their interest in participating and, if so, interview appointments were set up. This referral method ensured participants would be geographically diverse and representative of a variety of program types. These types included fully online full-time state sponsored programs, fully online part-time state sponsored programs, fully online and blended charter schools that were nationally networked, and fully online and blended charter schools that were independently operated.

Description of Participating Educators

In accordance with agreements made with participating educators and their employers, no biographical information about individual educators will be provided. However, all participants had more than three total years in education, all reported having the correct level of credential and certification necessary for their job titles (where applicable), and all had previously worked for varying lengths of time in brick-and-mortar schools. In addition, each participant was directly in charge of providing special education services. Educators identified themselves as teachers, local special education (SE) professionals, single school special education administrators, or multi-school/multistate special education administrators. Table 1 contains more information about educator job types.

Table 1 *Numbers of participant job types*

Job Type	Number of Participants
Teachers	4
Local SE Professionals	7
School SE Directors	8
Multi-school/Multistate SE Directors	7

Educators reported varying organizational structures and state policies about online learning that affected their work. Some worked in schools that were their own LEA while others were part of a brick-and-mortar school or district. In addition, some educators worked in states where online learning courses were required for high school graduation. Finally, some of the participants worked in states where online learning was widely available and there were many potential vendors of online learning curricula and/or school services, while others worked in states where online learning for K-12 students was fairly new and there were few policies regarding it. As we sought out educators for this study and worked with various programs, networks, and companies, we realized that it was in the best interest of online learning entities to share names of employees believed to be competent, even exemplary. However, this does not mean that the participants—even as a group—represented all online educators or that their perspectives were definitive. What we did attempt to do was capture a portion of the personal practical knowledge (Shaefer, Downey, & Clandinin, 2014) of educators in as many diverse settings as would agree to provide access to participants.

Data Collection

The major form of data collection in this study was semi-structured interviews. The semi-structured interview is designed to obtain objective responses from participants about their perceptions and/or experiences with phenomena. In order to use this strategy it was assumed that the educators at online schools had sufficient knowledge of and/or experience with the phenomenon under study (Marshall & Rossman, 2011). In this study, that phenomenon was providing accommodation, services, and support to SWD in online coursework as well as the numerous high stakes tests that they are charged to take.

Teachers and local SE professionals were interviewed between 1 and 8 times, depending on their consent and availability. These interviews lasted between 15 to 45 minutes. The school and multi-school/multistate SE directors were only interviewed once, but their interviews typically lasted between 40 and 90 minutes. Interviews varied in length because teachers in the online settings in this study were contractually obligated to be available to answer phone calls and attend to students immediately during their workday, whereas the administrators, managers, and directors in this study were not operating under such expectations.

A schedule or guide was used during the interview to provide a basis for comparison with other participants. The guide was developed using the extant research base (Bryman, 2012). In this study, the research base focused on supporting SWD. One additional consideration for interview questions came from Seidman's (2012) work, where he suggests interviews begin by exploring how participants came into the phenomenon. This format allowed educators to narrate their journey into education and specifically online learning and their present jobs. A final consideration shaping the protocol came from negotiations with the administrators in charge of research at the schools or who work directly for companies that helped us identify educators for the study. Negotiations came as iterations of protocol submission drafts, feedback, redrafting, and resubmission to the vendors. Table 2 (next page) lists main topics and the general order they appeared on the semi-structured interview schedule.

Educators answered questions, modified questions as they responded, and encouraged researchers to ask follow-up questions. In addition educators were encouraged to share stories, give examples from specific schools, and cite recent instances in their answers. Doing so leveraged the flexibility of the semi-structured interview (Bartholomew, Henderson, & Marcia, 2000). Additional flexibility occurred by using an orientation from Fontana and Frey (2005), where interviewing researchers listened with a sympathetic ear to the participants, taking a favorable ethical stance. In other words, researchers assumed that educators were capable employees, that they cared about SWD, and that ideas and experiences while working to provide support to this population had benevolent intentions.

Table 2 *Semi-structured interview schedule of topics and typical questions*

Experience in Education -How long have you been in education? -What schools/grades/subjects have you taught? -How did you come to your current position in this virtual school?
Experience with Accommodations -What accommodations have you overseen for students recently? -Were these typical? If not, how were they not? If so, how were they?
Participation in the IEP/504 process -In what ways do you participate in the creation of the IEP/504 process? -In what ways do you implement or interpret those documents?
Professional Development -What professional development activities do you participate in or oversee regarding students with disabilities?
Engagement with Colleagues and other Stakeholders -How do you work with other in your school, the schools of record, the learning coach, the parents, or the other entities to provide accommodations or other support to students with disabilities?
Technology -How does technology mediate your work? -What sorts of technology would help you mediate your work?
For the Multi-School Leaders/Directors -How do you perceive the preparedness of teachers and other employees to carry out IEP/504 accommodations and provide support to students with disabilities?

Data Analysis

A total of 62 interviews were conducted. Three interviews were not transcribed due to unintelligible audio resulting from technical difficulties. After interviews were transcribed, educators were presented transcripts to verify their accuracy before the coding processes began.

Saldaña (2012) refers to two types of coding: *lumping* and *splitting*. In lumping, long speeches of several sentences or more from interviews are taken holistically and assigned a broad code. By contrast, splitting occurs when data is grouped into segments consisting of a sentence or smaller. Lumping is concerned with finding the essence of a phenomenon; splitting encourages more careful scrutiny. Two researchers coded these interviews. They employed a first cycle or (first order) coding process where speeches were split into constituent parts and then lumped into more general codes. The first order coding type was *dramaturgical* (Berg, 2001; Feldman, 1995). In dramaturgical coding, researchers explore interpersonal and intrapersonal experiences and actions. In this study, particular attention was paid to educators as "social actors" (Lindoff & Taylor, 2005, p. 201) where educators engaged in strategies to meet challenges. During this inter/intra personal work, emotions and attitudes were also worthy of attention and taken into account during the coding process.

Coders recorded their agreement percentage after each meeting. Average agreement was 82 percent for split codes and 93 percent for lumped codes. Lumped codes were regrouped and reconstituted as second order themes in another round of meetings (Van Manen, 1990). The purpose of the second round of meetings was to consider interrelationships among the data from participants with different job titles and to look across the interviews as a whole data set. This level of coding was necessary to help guard against the risk that a theme could emerge because of a match between terminology or keywords and topics instead of true saliency to research purposes. The analytical process revealed patterns for teachers, SE professionals, and school-level directors that are based on overlapping roles they have in working with SWD. Findings are presented with evidence in the form of quotations that represent the consensus of the educators who were interviewed.

Findings from the Interviews

During data analysis interactional patterns between students, teachers, local SE professionals, and single/multischool administrators emerged. The teachers mostly interacted with students, and to a lesser extent, parents. The local SE professionals interacted with students at times, but mainly with parents. They also interacted with related service providers and brick and mortar schools of record when required. The administrators who were only in charge of one online school also interacted with related service providers and schools of record. Their interactions with students and parents were minimal and usually linked to facilitating communication with these other two entities. Administrators also reported to school executives or higher administrators, which sometimes were representatives of curriculum vendors or members of a governing body such as a school board. Any administrator could monitor or evaluate a teacher. Local SE professionals were often involved with the process of hiring and mentoring teachers who will work with SWD. None of the teachers evaluated their colleagues.

For teachers and the local SE professionals, their roles were bound tightly to relationship building responsibilities. They described their work in patterns of primary roles, accompanying concerns, and reconciliation strategies for meeting responsibilities to students and parents. The data obtained for these two groups are presented in this frame. However, for school and multischool directors, themes are presented as a series of tensions that overlap with the roles of the teachers and local SE professionals.

Teachers

Teachers in this study articulated roles around three major ideas: 1) ensuring course completion through extensive monitoring, 2) conveying curriculum to students, and 3) building and maintaining relationships with students and parents. Major concerns around these roles were identifying and assisting student non-workers, making inaccessible curriculum materials accessible, and maintaining positive relationships with stakeholders.

Non-working students. Teachers described non-workers as students that did not complete assignments or engage with course materials for a period of time usually lasting around two weeks. Teachers were required to contact students when they were deemed to be non-working by some sort of system trigger in the management software system. Contact, or attempted contact with non-workers could take as little as one hour or more than 3 to 4 hours of a teacher's working day. As one teacher describes—even laments—attending to non-workers can be difficult: "I am chasing them to answer the phone and various things. So calling, calling, calling without a response, and then emailing and texting and whatever else." In order to avoid this "chasing," as several teachers described it, they engaged in proactive monitoring phone calls to students they knew would struggle to keep pace, made pacing guides with students and families, and enlisted the parents as co-monitors. Teachers were very eager to embrace parents as co-monitors in the curriculum, but ultimately desired for students to monitor themselves. This is reflected in a teacher's description below:

> Another parent of a student with a disability just sent me an email today. She said that, "I was pleased that my son used his own initiative to go back to the videos and practice before taking the test. Usually it's me forcing him, maybe he's finally understanding that it actually saves him time if he does it right the first time. I'm trying to talk him into taking geometry next year online, even though he prefers to take classes in person, Mike just seems to do math better online because he has extra time to complete the course, resubmit assignments, and review videos over and over. Regular math classes on campus just don't allow him the opportunity to really learn the material.

The online teacher viewed this experience as a success because it resulted in the child doing work autonomously and the parent being in alignment with the teacher and the school. The role of the teacher as it emerged in this study was to help parents help students do work, which led to achievement and also positive attitudes about online learning.

Inaccessibility of curriculum. Teachers were concerned the curricula they received and were required to teach was inappropriate for many SWDs and they had a sense the tasks would not prepare students to perform well in high stakes testing. Here is how one teacher discussed the curriculum for SWDs:

> I would just say that 9 out of 10—no, probably 10 out of 10 have extended time listed for assignments and tests. I'd say our students with disabilities that have final reports and things just need a little bit of extra time and not so much like extra time as in like extra weeks in the class, but extra time on the telephone to explain things a few times over or to let them process what can be difficult assignment tasks.

Teachers in this study indicated that students needed extra instructional time to account for the inaccessibility of the curriculum. Time was spent providing direct instruction, but not so much instruction about content related skills. Rather direct instruction was given on the course and how to access the course's content.

Other attempts to give feedback often focused on redirecting students to other online resources, many of which are emerging:

> So within our feedback, if they really messed up on capitalization or punctuation, we have a link and, just to copy and paste; we can put in our feedback, "Hey, it looks like you're having trouble with your capitalization. Why don't you click here and watch this video on capitalization and try to go back and fix your mistakes?" So that's going to be so helpful, because getting them to actually go to that student help website on their own is hard, but when they have a link they can just click on and it goes straight to the video, I'm excited about that.

The description above is not about giving instruction about capitalization, but rather about directing the student to another resource online. Further, the video about capitalization was not differentiated (e.g. there was not a way to target instruction). When it comes to accessibility, the teachers in this study wanted to ensure students had enough access to technology to understand the task. In accordance with the concern for non-working students, the goal was to help the students become as independent as possible.

Relational breakdowns. Teachers were contractually obligated to have regular communication with parents. Generally, teachers reported receiving 20 or more calls per hour during certain points of the day or in the year. The busiest times often were tied to spring graduation. Constant calls to and from parents and students often focused on reminding non-workers to work and make sure students understood lesson requirements, to conduct periodic oral assessments, or take tests. Tests were embedded in the courses as unit exams, but there were also final exams for courses or tests required by states. Pressure to

take tests and perform well caused emotions to run high. However, teachers, students, and parents had heated interactions for other reasons, too, usually having to do with turning in work:

> It took this student one minute and 20 seconds to complete this practice test, even though mom said her daughter was working on it for hours. And I took a picture on my cell phone of the time log, and I sent it to mom. Well, then after mom yells and screams at me I ended up negotiating for the girl re-do the test.

Not all emotional supports teachers provided were related to the experiences students were having in online learning. Teachers were also told painful stories about students' lives including health problems as well as aspects of their socioeconomic circumstances, such as homelessness. Teachers were also made privy to students' negative experiences in other learning situation:

> And, she's like really behind and she won't be in 10th grade if she doesn't finish the segment and her grade went down tremendously and come to find out, she had a 5th grade math teacher that used to just make her cry.

Teachers reported these stories with concern and they reported taking these into account as they worked with students. In particular, they felt an obligation to protect students from further negative experiences in school. However, the bottom line was that students had to continue to work steadily, even in programs where teachers initially lauded online schooling as a way to break away from tight timelines endemic to traditional school.

Local SE Professionals

Local SE professionals in this study constructed their roles to leverage their knowledge of disability policy and their status of holding more responsibility than a teacher, but with less social distance than a regular administrator. These educators were teachers who had some administrative responsibilities, but were not considered administrators. Data from interviews with local SE professionals revealed themes of conflict mediation, course load counseling, and disability policy enforcement.

Conflict mediation. Local SE professionals described spending much of their time helping parents negotiate with teachers and with other school officials. Below, one local SE professional illustrates her mediating role:

> Sometimes I work with students. Like, today I have a conference call set up. I'm waiting for the teacher to tell me exactly the time, but I'll be meeting with the parent, the teacher and the student and myself in a conference call setting to work out issues of the student not working, and making sure that we're all on the same page and getting some buy-in from the student. But for the most part, right now, I don't necessarily work with students.

Local SE professionals support teachers in their roles as monitors of student progress and as teachers work to enlist parents as co-monitors. In the narrative above, the local SE professional offered her support towards her teacher, but these professionals also told stories of advocating for parents to work with teachers to arrange for student accommodations and elicit empathy for students' personal and/or family circumstances, and even advising teachers and colleagues about issues of special education law. One local SE administrator referred to these roles as managing "sticky situations":

> I will say that teachers do come to me on what we call the "sticky situations." It's a parent who is very angry or a teacher who just doesn't know what to do and they may not have the confidence in each other. So instilling confidence in them is something all of us have talked about; to know

> that the information they're providing is accurate--that they just need to have the confidence to provide it. A lot of people get afraid when special education comes in because it is so sticky with laws. And we are under such an odd umbrella of what is written and what is not written for our online context. So most of our conversations, whether they take place using instant messaging, email, or on the phone, would be based upon a negative situation. And the teachers are looking for some guidance/approval of their manager that, "Is this the right?" or "Is this an okay answer?"

The mediation roles in these cases were not simply administrative cases of teachers, students, and parents not getting along. Local SE administrators played fundamental roles in shaping support for SWD that is both formal (through IEP documents and state policies) and informal through the daily decisions teachers make as they implement IEPs.

Calling local SE professionals essentially served as calling a hotline for information about laws and support for teachers' professional judgment. Local SE professionals, particularly when they were teachers in the same online schools as where they currently worked, were uniquely positioned as people who were listened to and respected for their expertise by teachers and families. Indeed they said that they wanted to help parents and teachers understand not just laws and policies, but how laws and policies apply to individual children in particular circumstances. Since laws and policies change and evolve rapidly, local SE professionals are on the front lines of keeping up with legislation and their schools' policy responses.

Course load counseling. Local SE professionals spent much of their time doing course load counseling for SWD, even though the online schools where they worked had guidance counselors. Course load counseling referred to: a) enrolling students in an online school by answering questions about the program; b) advising within an online school by making sure students have the necessary kind and number of courses for graduation; and c) recommending that students move out of online school entirely. The following narration is an example of how local SE professionals worked with students within the online school:

> This boy was trying to take a semester of four courses. I was concerned because his mother had no computer savvy. The son had never taken any online courses before. So taking four courses was going to be overwhelming. So I explained to the mother if they dropped two and postponed them, and he worked on two courses at an accelerated pace, he would be better off.

Decisions about course loads were based on the local SE professionals' experiences as online teachers and their experience mediating between teachers and parents where students have a difficult time keeping up with multiple courses. From the perspective of these local SE professionals, it was better for students with disabilities to take online classes one at a time and move faster rather than several classes together and move more slowly. Such a strategy was not the recommendation for all students, and of course, may not be the case for all online learning programs, but it was heavily promoted among the local SE professionals we interviewed regarding students with disabilities. They further explained that course counseling occurred in order to avoid having to counsel students out of their online schools entirely. Local SE professionals did not enjoy counseling parents against online learning, but they all said that they have counseled students out of their schools. One local SE professional explained this tension:

> I do also believe that the virtual setting is not for every student. I'm talking about students with disabilities because that's what these interviews are about, but really in general this is not for everybody. And no matter what the accommodations are, it's not a good fit for some kids. Now, on the other side of that, this is a godsend for many families; it just fits their bill.

Local SE professionals were ultimately looking for ways to keep students in online schools because they believe that taking courses online can be life changing for many families with children who have struggled in traditional settings. Nevertheless, there is a sense that some students would be better off in other educational settings (i.e., traditional settings). A critical part of the local SE professionals' role is to provide information to families making this decision.

Policy enforcement. Above all, local SE professionals constructed roles for themselves around policy enforcement. In fact, their roles as mediators and course load counselors were directly tied to policy enforcement. Local SE professionals explained that many laws and policies that are supposed to ensure that SWD receive an appropriate education do not attend to what happens as children transition into and out of online schools. One local SE professional referred to spaces of obsolescence as "funkiness":

> There is all this funkiness with where we fall in the language of the law with reference to brick and mortar schools; we had a student who was arrested for having a controlled substance. We had to have a meeting to determine whether his disability played part in that. I was able to attend those meetings. But, because I, as a virtual school provider, was not part of the team because we are not the LEA, I do not get to help make any determination. But I do have to worry about how that determination interacts with our policies.

Some online schools are their own LEA and some are not. Most local SE professionals in this study worked at schools where they were only able to participate at a very peripheral level in the creation of IEPs that they must implement. Many of the accommodations for example, were about preferential seating or bathroom breaks—things that do not apply directly to a student working from their home using the Internet to do their lessons. However, parents do not always understand the policy constraints some online schools face. As one SE professional told us:

> A mother wrote to me asking to please let me know what other paperwork would be needed to achieve an IEP plan for her son. And so I followed up with an email and said,
>
> "We're happy to provide accommodations, but you know, we don't implement IEPs—the school of record does." I think mom really has this in her mind that our school is the new school of record, but it's not.

Local SE professionals were constantly learning new information about disabilities, policies, and individual students; then they were responsible for dissemination. For example, parents of SWD and previous schools of record do not always disclose that children have disabilities or other relevant exceptionalities when they enroll in online courses. If the teachers in online schools are "chasing" students, the SE professionals are "chasing" information.

School-wide and Multi-school Program Administrators

School-wide and multi-school program administrators in our study constructed their roles as narrative tensions (Clandinin & Connelly, 2000). The tensions metaphor is appropriate given the oversight to which they are subjected in most states. One administrator gave the following example of such surveillance:

> In our state we undergo triennially a self-review, a special education self-review, and we have to go through and audit our files according to what a state is looking for. There's a 34-page compliance file: a line item manual. And it varies depending on complaints we may have received, identified areas of needs of concern, and our training processes. But one of the things

> my colleague and I had to tackle when we came to this position was that 11 of 14 schools simultaneously underwent a very intensive and verification review by the State Department of Education. And they came in and they basically took over our office. For a good week they were there in person, but for 6 months we were working hand-in-hand with them, pulling files and going through training and process and procedures and such. And we came out of that completely clear. So when we talk about compliance, it's because we lived it (Multischool administrator).

Under these circumstances of oversight it is unsurprising that tensions dominate the work of high-level online special education administrators. Tensions described to us included: a) the need to conceive of online teaching as being both distinct and similar to teaching in traditional settings; b) a strong desire to advocate for SWD while also pushing them out of online learning and out of special education; c) a deep rhetoric around compliance to the law with an accompanying wish that their schools could be excused from many regulations; and d) an acknowledgement of the role of the parent and or learning coach sitting next to students as paramount for success coupled with an insistence that Internet-based delivery models are superior to traditional ones. The following sections focus on each of these tensions.

Teaching online/offline. The school level and multi-state directors we interviewed had both teaching experiences and non-teaching experiences in schools (e.g. guidance counselor). Some were adamant that teaching in a traditional school tainted a teacher or that such experience made it difficult to transition into online teaching. However, most of the participants felt successful teaching in a traditional school and successful teaching in an online school required similar practices, even though teaching online required new knowledge bases. One administrator articulated this position quite definitively:

> The learning curve is pretty big depending on a teacher's experience in the brick and mortar classroom. It's really difficult to go from no teaching experience or just student teaching into the virtual setting because you have no frame of reference. How do you figure out how to do things online if you don't know how to do them face-to-face? (Single school administrator)

Indeed many of the teaching stories that we were told started out as compare/contrast illustrations between traditional and online schooling. These comparisons were uneasy since online schooling and traditional schooling options were regarded to be in competition, yet there was a sense that some kind of a universal or general way of teaching or instructing existed that would be helpful not only in both settings, but also for students with and without disabilities. Administrators also reported actively signaling to teachers that they should be looking for universal strategies while maintaining the personalization expected of online learning.

Advocacy and push out. One of the most striking tensions expressed by the administrators was the notion that online learning was a viable option for everyone, except for a small minority (e.g., SWD). As one administrator stated:

> I would say that the biggest group that has the most challenges would be your students with emotional disabilities, mainly because also those students need a highly structured environment and independence is expected when you're operating in a virtual world (Single school administrator).

Administrators in this study came from traditional settings where they worked with SWD and where some even had children of their own with disabilities. They were torn between their beliefs about inclusion and their practical knowledge about high attrition rates in online environments among SWD:

> In an online environment, there are certain students that it's just not the right academic environment for. And our special ed staff are encouraged to ask the right questions and have the

> right meetings with parents to make sure that this is a good academic environment for that student, and the family is getting the best service that they can. Sometimes these meetings result in a recommendation that is "you know, this may not be the best place for you." But that's tricky because parents want choice and they want to do what they want to do; so sometimes it's a matter of not just counseling them out, but letting them know about the realities of being a learning coach for special ed student at home and what we can offer and maybe what we can't (Multi-school administrator).

This administrator's description of what happens when parents want a child in an online program who may not be suited for it from an administrative standpoint suggests that parental, social, and cultural resources are part of the decision as to whether to admit the child into online programs. The use of a word like "service" in this context also suggests a certain consumerism that goes both ways. The school is positioned as trying to provide an educational product, but performance improves when they can start with certain kinds of human capital. The example from this administrator also connects to special educators' advice to parents as informal, but well communicated administrative policy.

Regulation rhetoric. While educators in this study sought clarity on how to best educate SWD in online environments, they viewed their roles in compliance as being well defined. The individuals we interviewed placed high importance on monitoring student performance, tracking student pacing, and managing billing procedures, all of which maintain online schools' funding sources. These monitoring and tracking procedures are viewed as being important to accountability. As one administrator stated:

> In our larger schools that are obviously more established and have more local staff, I do general oversight. In our smaller schools, and specifically our new schools, I'm very involved. In those situations, I play a much more active role in monitoring IEP compliance, and helping to make sure that we have met the requirements that we need to get all of our state and federal funding. It's a much more involved role, the less local staff there is. It's a question of expense (Single school administrator).

Compliancy emerged as the administrators work to maintain active roles in the schools for which they are responsible. Attending to duplicity—making sure that nothing is said in the meeting that is non-compliant—enables the administrators to accomplish the tasks necessary to qualify for continued funding. Being in compliance requires a hierarchy of supervision where information is duplicated at all levels. Another administrator described these procedures as a system of checks to ensure compliance with federal guidelines:

> Special ed teachers have lead teachers and mentor teachers who coach and guide them if they have questions. I meet regularly with the lead teachers and guide and support them in directing their teachers. Teachers are asked to submit their IEPs to their lead teachers for a review check prior to the meeting. These are usually due 48 hours before the meetings, so that we can build capacity for ensuring compliance (Single school administrator).

Pre-submission of IEP documents is part of the transparency goal in a school, leading to accountability. As administrators engage in accountability they are able to provide signals to teachers about their own identities. In so doing, a feedback mechanism evolves for helping teachers take up student monitoring roles.

Online education as collaboration. Administrators had concerns about how related services are provided to students in the online learning environment as well as how the role of parental support impacts student learning outcomes. Most of the administrators, even though they thought online schools were capable of providing important educational opportunities, expressed a belief that a brick and mortar

school could provide an education as a community-based experience and that online learning environments could not easily replicate this benefit:

> Personally I think one of the weaknesses of online learning and one of the concerns I have, is that in some cases we have students and families that need face-to-face interaction everyday for the welfare of the child. Online, you're not putting eyes on that child every day. There's no eyes on that child any day really even though you have contact with the family and contact with the child. That's a concern to me and that's a concern that I share out to my staff. Those families that aren't engaged. You just don't get to see them (Single school administrator).

The person who can put their eyes on the child is the parent or learning coach, as some online schools refer to it. The parent/learning coach's constant availability is paramount for the success of SWD. For example, as another administrator stated: "[A] mother wanted to be able to have her child sit and do online work while she did the laundry and other things. But this isn't like that; you have to really pay attention to what that child is doing."

Related to the issue of educational preparation as a means for building and maintaining social networks is the issue of related service providers who provide therapies and other services to SWD. Nearly every administrator interviewed shared concerns with the ability of the online learning environment to properly staff related service providers. The administrators did see value in the related service providers but described the service provided as an undue burden they must assume in order to maintain compliance. Per one administrator:

> Providers are difficult to find. Related services can be and will be expensive. We are just getting introduced to the idea of online speech therapy, which we offer to our students. The parent has to see the value of these therapies particularly if their student benefits from it. If a student cannot be worked with the online for therapy, then a specialist needs to be brought to them directly (Multistate administrator).

Teleservices are providing part of the answer to the problem of scarce related service providers, however some teleservices have been described as being low in quantity and/or difficult to judge in terms of quality. One administrator elaborates on the difficulty of meeting demands for related service providers in the online learning environment:

> We've been really, really creative. We call hospitals for physical therapists and occupational therapists; we call assisted living centers for speech language pathologists. We just make sure that from a certification standpoint, that they are able to work with the students and that they have the correct clearance to work. We've got a fantastic system for an invoicing standpoint because we're able to make sure if you have a student who is supposed to get four sessions a month and somebody turns in an invoice with six sessions a month, it'll get flagged. We're able to contact that person and say, hey, you know, they were only supposed to have four (Multistate administrator).

Again we find these descriptions to be replete with talk of compliance. The administrators described a structure to ensure that related service providers, when found, were not overbilling for their services. This formed tension-filled—even contentious—relationships between limited human resources (providers) and limited fiscal resources (funding).

Discussion

Our study looked at the roles necessary in developing, supporting, and following through as providers of accommodations and other forms of support for SWDs in online courses. Participants included teachers, special education case managers, and single/multischool special education administrators. Each group of educators had different patterns of interaction with SWD and their parents, with more advanced administrators having almost none, and in some cases, little contact with online teachers. Most participants had started in education as teachers in traditional settings and had worked their way into their current respective positions. The migration of staff from brick and mortar to online schools spurred much of the *modus viviendi* (Goffman, 1959), but it also brought uneasiness around this *modus,* with intentions to mitigate or overcome it. The educators knew what they were trying to do in online learning was different, but they relied on the *modus* of traditional schooling to problem-solve around issues of educating SWD because laws and policies are ill-equipped to deal with online learning and because communicating laws and policies to parents is onerous and time-consuming when there is such a push to ensure students are moving through coursework in a timely (although not fully prescribed) manner. The dance of interacting around the issue of engagement elicits a pattern of consensus that drives families of SWD to keep up the course pace or find another option.

Shifting from responsibility to accountability has been described by Noddings (2013). Responsibility emerges as parents, students, and educators feel obligated to make sure that others have positive experiences. In this frame, parents do not report to teachers; teachers do not report to parents. Instead, parents and teachers communicate around students. Teachers have the most contact with students and multischool state directors have almost none, yet beliefs like "online learning is for everyone except for who it isn't" have permeated every level of the online school structure. Where do those students belong who do not belong in online learning? Apparently they belong in traditional school. Such an orientation begs further inquiry into the status of SWD, and students with other difficulties, in online schools. If all students are to have a legitimate place, what has to happen to enable that place? Policies, funding, technology, and social priorities are at stake.

With both teachers and the local SE professionals, their interviews were bound tightly to the relational responsibilities related to primary roles, accompanying concerns, and reconciliation strategies for meeting the responsibilities embedded in the roles. Each of these groups focused on monitoring students and enlisting parents as co-monitors. The behavior sought was engagement in online curriculum to complete tasks that would lead toward course completion. In undertaking this monitoring, it was necessary to interact with parents and develop interpersonal skills for mediating conflict and disagreement. It was also an important goal of the local SE professionals to make sure that SWD are enrolled in what they described as the correct type and correct number of courses with the teachers that would be most sympathetic to the students. The educators took this charge to share expertise, monitor, manage courses, and build relationship as major responsibilities. We wondered about students who had exceptionalities but who would not necessarily have an IEP. Who would be responsible for them? How would educators find out about these exceptionalities *before* problems emerge? How can these special circumstances be discovered and addressed in online schools when, as one administrator reported, "no one puts their eyes on the child?"

For school and multi-school administrators, their distance from the students and teachers made it more difficult for them to articulate responsibility; the focus typically was on accountability. The further up the line of authority we moved in our interviews with administrators, the more accountability language we found in their descriptions of their roles. Noddings (2013) argued that an accountability-centric focus is a problem because it causes people to become overly worried with self-validation through structures like compliance. This compliance rhetoric is exactly the cause of the tensions articulated by the school and regional administrators. Even though the administrators hoped teachers would be sympathetic and

sensitive, they hired teachers to make their role as compliance officers easier to manage. At all levels (teachers, specialists, administrators) there was a push to make parents accountable for student learning, especially for students with disabilities.

Another problem with compliance and "living it," one multischool administrator explained, is that it starts to look like *institutional isomorphism*—a theory which argues that when resources and polices are shared, entities will come to resemble one another (DiMaggio & Powell, 1983). As online schools try to become a more attractive option for families, their efforts to ensure personalized student learning and teacher productivity override efforts to provide individualized accommodations in accordance with current disability law. The current difficulties in reconciling technologically-based personalization with legal individualization puts online school at risk of looking more like traditional public school in areas in which the public schools have received the most criticism—namely the autocracy and technical, impersonal ways of interacting with stakeholders (Waller, 1932).

Recommendations and Directions for Future Research

While our study was not designed to produce generalizable results, the fact that these educators—representing an array of programs in various geographical, political, and technological terrains—were able to crystalize on several important points lends trustworthiness to our findings (Richardson, 2008). Directors of online learning programs and advocates for online learning can read the findings and determine for themselves what might resonate, which is the true goal of any qualitative study (Marshall & Rossman, 2011).

Findings from this study suggest a need to further explore the relationship between administrators of online learning programs and their preparation to effectively construct roles that acknowledge the complexity of working with SWD in online settings when much of the policy protections afforded to SWDs were designed to give them access to a school building and specially trained people inside it. Further, there are few provisions for students who have exceptionalities who do not have IEPs. Section 504 is contingent on self-advocacy and if parents feel their child (or children) would be better off without the label of exceptionality, and since the online environment allows parents to choose whether or not to disclose such information, they may not do so.

The administrators in this study revealed that they had been selected for advancement from a pool of online teachers already in a school, network, or under a vendor's employment, but most had not taught as extensively online as they had in traditional settings. Not only is preparation to teach important for learning the laws and designing lessons that optimize technologies in these settings, but also for preparing educators to think about long term interactions with various people within the entire online school system, and not just in online classrooms (Archambault & Kennedy, 2012).

Considering the trajectory from traditional teaching to online teaching to online administrating, more research is needed on teacher preparedness to not just educate in the online environment, but how to help teachers move between these environments smoothly. In turn, transitioning from online teaching to online administrating or even traditional teaching to online administrating deserves practical, empirical, and policy attention. In this frame, online schools will be better positioned to avoid the more problematic aspects of the traditional institutions from which they flow and cultivate an atmosphere of responsibility for all children.

The contents of this report were developed under a grant from the US Department of Education #H327U110011. However, those contents do not necessarily represent the policy of the US Department of Education, and you should not assume endorsement by the Federal Government. Project Officer, Celia Rosenquist.

References

Apple, M. W. (2004). *Ideology and curriculum*. New York, NY: Routledge.

Bartholomew, K., Henderson, A. J. Z., & Marcia, J. E. (2000). Coded semistructured interviews in social psychological research. In H.T. Reis & C.M. Judd (Eds.). *Handbook of Research Methods in Social Psychology* (pp. 286-312). Cambridge, MA: Cambridge University Press.

Berg, B.L. (2001). *Qualitative research methods for the social sciences.* Boston, MA: Allyn and Bacon.

Bernstein, M. (2013). Whose choice are we talking about: the exclusion of students with disabilities from for-profit online charter schools. *Richmond Journal of Law in the Public Interest*, *16*(3), 487-525.

Bryman, A. (2012). *Social research methods*. Oxford, UK: Oxford University Press.

Bullingham, L., & Vasconcelos, A. C. (2013). 'The presentation of self in the online world': Goffman and the study of online identities. *Journal of Information Science*, *39*(1), 101-112.

Burnham, P., Gilland, K., Grant, W., & Layton-Henry, Z. (2004). *Research in methods in politics.* Basingstroke, UK: Palgrave MacMillan.

Carnahan, C., & Fulton, L. (2013). Virtually forgotten: special education students in cyber schools. *TechTrends*, *57*(4), 46-52.

Compton, L. K. L., Davis, N., & Mackey, J. (2009). Field experience in virtual schools—to be there virtually. *Journal of Technology and Teacher Education*, *17*(4), 459-477.

Council of Chief State School Officers. (1996). *Interstate School Leaders Licensure Consortium (ISLLC) standards for school leaders*. Washington, DC: Council of Chief State School Officers.

Crawford, L., & Ketterlin-Geller, L. R. (2013). Middle school teachers' assignment of test accommodations. *The Teacher Educator*, *48*(1), 29-45.

Davis, N. (2011). *Leadership for online learning within and across secondary schools: an ecological perspective on change theories*. Retrieved from http:// www.educ.utas.edu.au/users/afluck/ifipwg3-3/Activities/Nashville11/Papers/wg332011_submission_1.doc.

Davis, N. E., & Rose, R. (2007). *Professional development for virtual schooling and online learning*. Vienna, VA: NACOL.

DiMaggio, P. J., & Powell, W. W. (1983). Collective rationality in organizational settings. *American Sociological Review*, *48*(2), 147-160.

Feldman, M. S. (Ed.). (1995). *Strategies for interpreting qualitative data* (Vol. 33). Thousand Oaks, CA: Sage.

Fontana, A., & Frey, J. H. (2005). The interview: from neutral stance to political involvement. *The Sage handbook of qualitative research*, *3*, 695-728.

Gillespie, A., & Graham, S. (2014). A meta-analysis of writing interventions for students with learning disabilities. *Exceptional Children*, *80*(4), 454-473.

Glass, G. V & Welner, K.G. (2011). *Online K-12 schooling in the U.S.: uncertain private ventures in need of public regulation*. Boulder, CO: National Education Policy Center. Retrieved from http://nepc.colorado.edu/publication/online-k-12-schooling.

Goffman, E. (1959). *The presentation of self in everyday life*. New York, NY: Doubleday.

Individuals with Disabilities Education Improvement Act of 2004, P.L. 108-446, 20 U.S.C § 1400 et seq.

Individuals with Disabilities Education Act of 1997, P.L. 105-17, 20 U.S.C. § 1400 et seq.

Jackson, P. W. (1968). *Life in classrooms*. New York, NY: Teachers College Press.

Kaufman, A. K., & Blewett, E. (2012). When good enough is no longer good enough: how the high stakes nature of the No Child Left Behind Act supplanted the Rowley definition of a free appropriate public education. *Journal of Law & Education*, *41*(1), 5-25.

Kennedy, K., & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: a national survey of teacher education programs. *Journal of Teacher Education*, *63*(3), 185-200.

Ketterlin-Geller, L. R., Alonzo, J., Braun-Monegan, J., & Tindal, G. (2007). Recommendations for accommodations implications of (in)consistency. *Remedial and Special Education*, *28*(4), 194-206.

King, N. (2004). Using interviews in qualitative research. In C. Cassell & G. Symon (Eds.) *Essential Guide to Methods in Organizational Research.* London: Sage.

LaFrance, J. A., & Beck, D. (2014). Mapping the terrain: educational leadership field experiences in K-12 virtual schools. *Educational Administration Quarterly*, *50*(1), 160-189.

Levene, J. & Boulware, D.D. (2014). Sustaining innovation through online professional development: a design approach. In M. Searson & M. Ochoa (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2014* (pp. 2901-2906). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Lilleker, D. G. (2003). Interviewing the political elite: navigating a potential minefield. *Politics*, *23*(3), 207-214.

Lindoff, T. R., & Taylor, B. C. (1995). *Qualitative communications research, 2nd ed.* Thousand Oaks, CA: Sage.

Mandinach, E. B. (2012). A perfect time for data use: using data-driven decision making to inform practice. *Educational Psychologist*, *47*(2), 71-85.

Marshall, C., & Rossman, G. B. (2010). *Designing qualitative research*. Thousand Oaks, CA: Sage.

McLeskey, J. (2011). Supporting improved practice for special education teachers: the importance of learner-centered professional development. *Journal of Special Education Leadership*, *24*(1), 26-35.

Mellard, D. F., Deshler, D. D., & Barth, A. (2004). LD identification: it's not simply a matter of building a better mousetrap. *Learning Disability Quarterly*, *27*(4), 229-242.

Noddings, N. (2013). *Education and democracy in the 21st century*. New York, NY: Teachers College Press.

Pajak, E. F. (2012). Willard Waller's *Sociology of Teaching* reconsidered: "what does teaching do to teachers?" *American Educational Research Journal*, *49*(6), 1182-1213.

Richardson, L., & St Pierre, E. A. (2008). Writing: a method of inquiry. In N. Denzin & Y. Lincoln (Eds.) *Handbook of Qualitative Research 3rd ed.* (pp. 959-978). Thousand Oaks, CA: Sage.

Saldaña, J. (2012). *The coding manual for qualitative researchers*. Thousand Oaks, CA: Sage.

Schaefer, L., Downey, C. A., & Clandinin, D. J. (2014). *Narrative conceptions of knowledge: towards understanding teacher attrition.* Bingley, UK: Emerald Group Publishing Limited.

Seidman, I. (2012). *Interviewing as qualitative research: a guide for researchers in education and the social sciences*. New York, NY: Teachers College Press.

Van Manen, M. (1990). *Researching lived experience: human science for an action sensitive pedagogy*. Albany, NY: SUNY Press.

Waller, W. (1932). *The sociology of teaching*. Hoboken, NJ: John Wiley & Sons.

Watson, J., Murin, A., Vashaw, L., Gemin, R., & Rapp, C. (2013). Keeping pace with K-12 online and blended learning: a guide to policy and practice. Retrieved from http://www.kpk12.com/reports/

Zirkel, P. A. (2013). Is it time for elevating the standard for FAPE under IDEA? *Exceptional Children*, *79*(4), 497-508.

An Examination of an Online Tutoring Program's Impact on Low-Achieving Middle School Students' Mathematics Achievement

Shanan Chappell, Pamela Arnold, John Nunnery, and Melva Grant
Old Dominion University

Abstract

The purpose of this mixed methods study was to determine the impact of synchronous online tutoring services on struggling middle school students' mathematics achievement. The online tutoring was provided as a response to intervention (RTI) Tier 3 support (intensive, individualized intervention) in schools implementing a school-wide mathematics program that addresses Tier 1 (high-quality classroom instruction) and Tier 2 (small group interventions). We employed quasi-experimental, within- and between-group designs to examine impacts for 119 students in two schools to measure the tutoring's impact on mathematics assessment scores. We also conducted qualitative analyses of student and tutor postsession commentary. The findings suggest that the tutoring contributed to statistically significant gains in student assessment scores postintervention. Online tutors' descriptions of their practice centered on ongoing progress monitoring of student learning, delivery of guided practice to students, the use of multiple explanations and representations of target concepts. Student perceptions of the online tutoring were predominately positive in nature.

Introduction

This article examines the impact of an online tutoring program on struggling middle school students' mathematics achievement, tutor descriptions of their online tutoring practices, and student perceptions of tutoring experiences as they occurred in real time. The tutoring was provided as a Tier 3 support to enhance the overall effectiveness of a school-wide mathematics reform effort, PowerTeaching math (PTm), a program funded under the U.S. Department of Education's Investing in Innovation scale-up initiative. This initiative is focused on the dissemination of research-based educational programming to high-need schools. PTm is grounded in research on cooperative learning, and focuses on teamwork among students within a structured cycle of instruction (Slavin, 1995). There is an extant body of research

showing positive achievement effects for the instructional program, particularly among adolescent students (Nunnery, Chappell, & Arnold, 2013). Within a response to intervention (RTI) framework, PTm embeds Tier 1 and Tier 2 supports through the provision of professional development and resources that focus on specific elements of primary and secondary prevention of learning difficulties, including (1) effective instructional strategies, (2) differentiation, (3) strategic grouping of students, and (4) progress monitoring (O'Connor & Sanchez, 2011). Online mathematics tutoring was piloted in this context as a Tier 3 intervention for a subset of students who struggled the most with mathematics.

Fuchs et al. (2011) identify instructional explicitness as the first principle of effective intervention for students with mathematics difficulties. Schema theory suggests that learners develop recognition of mathematical problems across numerous experiences to abstract problem-solving strategies that may be generalized (Brown, Campione, Webber, & McGilly, 1992). In other words, they develop schemas, or categories of problems that encompass similar types, and learn to apply increasingly effective strategies according to type. While typically developing students are able to do this more inductively, students who have accrued math deficits benefit from more explicit instruction facilitated by an expert who is able to provide clearly articulated schema-broadening instruction, with guided opportunities to recognize and learn the underlying mathematical structure of various problem types and specific transfer features (e.g., combinations of problem types) (Cooper & Sweller, 1987; Fuchs et al., 2011; Kroesbergen & Van Luit, 2003). Theoretically, individualized mathematics tutoring should provide increased opportunity for instructional explication, leading to broadened schema among students who are having difficulty constructing these independently. Individual mathematics tutoring as a Tier 3 intervention also provides students with mathematics difficulties with increased individualized progress monitoring. No method works for all students all the time; students who struggle with mathematics even within the context of an instructional environment that applies validated, research-based methods thus require individual tailoring. In these cases, systematic, ongoing progress monitoring facilitates the formulation of adjusted interventions that are effective for those students (Fuchs et al., 2011).

Although common characteristics of effective tutoring have been identified in the literature (Fashola, 1998), much of the focus has been on literacy rather than mathematics. With many school districts and funding agencies requiring research-based evidence on the effectiveness of strategies, the need for sound research on mathematics tutoring more specifically is clear. One earlier analysis of educational outcomes of mathematics tutoring revealed relatively large effect sizes in improving student achievement (Cohen, Kulik, & Kulik, 1982). Huang (2013) compared tutoring influences on performance across countries, controlling for social and educational differences among them, and found that tutoring significantly increased national mean performance in mathematics. However, other researchers have concluded that not enough is known about the effect of tutoring on mathematics scores (Ritter, Barnett, Denny, & Albin, 2009; Baker, Rieg, & Clendaniel, 2006). Furthermore, some studies have found promising evidence to suggest that interactive online mathematics tutoring in particular may result in learning and achievement benefits for students (Beal, Walles, Arroyo, & Woolf, 2007; Chappell, Nunnery, Pribesh, & Hager, 2011; Nguyen & Kulm, 2005), but less is known about how these programs function as Tier 3 interventions in contexts that carefully structure Tier 1 and 2 supports. This study explores how online mathematics tutoring impacted student achievement outcomes and perceptions in the context of a wider reform that provided primary and secondary supports, and functioned to augment that effort as a tertiary intervention.

Literature Review

Mathematics Tutoring

Instructional tutoring has an extensive history in American education. Tutoring services may be presented in a variety of formats and serve an array of purposes, though the overall goal of tutoring is generally to improve student achievement. The body of research on tutoring services is extensive and

reported results of tutoring vary widely (Chappell et al., 2011). Research findings about the effectiveness of tutoring for improving mathematics performance have been similarly inconsistent (Bray, 2011; Huang, 2013; Rothman & Henderson, 2011).

Although no specific model of effective supplemental tutoring has emerged from the literature to date, a number of successful programs have been identified, and these share some common characteristics, including well-trained, focused tutors; one-to-one tutoring experiences; a structured but flexible prescribed instructional plan; ongoing assessment to inform instructional efforts (Fuchs et al., 2011); and consistency in receiving tutoring services (Fashola, 1998; Wasik, 1998; Topping, 2000; Gordon, 2003; Sanderson, 2003). Fashola (1998) summarized the issue concisely: Programs that "provide greater structure, a stronger link to the school-day curriculum, well-qualified and well-trained staff, and opportunities for one-to-one tutoring seem particularly promising" (p. 55).

Other research offers additional insight about structural elements and tutor characteristics for effective mathematics tutoring programs. Effective mathematics tutors utilize their knowledge about mathematics content and curriculum when tutoring to generate multiple explanations and representations of the content for and with students, which is required for the development of mathematical understanding (Bray, 1999; Charalambos, Hill, & Ball, 2011; Hiebert et al., 1997; Rothman & Henderson, 2011). Effective tutors also know when and how to press learners, what resources to use, and how to use strategic questioning in lieu of telling or giving answers (Donnelly, 2013). Additionally, mathematics tutors who cultivate relationships with students and their teachers are more effective because in-school instructional activities and tutoring can be designed synergistically to build upon each other (Burns, Senesac, & Symington, 2003; Rothman & Henderson, 2011).

Online Tutoring

Instructional technology is becoming more and more prominent in educational settings, expanding beyond industry and higher education into K-12 environments. A systematic review conducted by Kulik (2003) indicated that instructional technology was becoming not only prominent in K-12 education but also a progressively more effective instructional strategy. Programs that offer online services may be able to provide benefits beyond just instructional support. For example, online tutoring programs can combine effective features of traditional tutoring services, such as research-based curricular resources and well-trained, qualified tutors, with synchronous supplemental instruction that can meet students where they are—academically and physically (Vasquez & Slocum, 2012). Online, synchronous services that offer one-to-one, real-time tutoring can reach students in busy, urban areas as well as isolated, rural schools (Koerwer, 2007).

Over the past decade, online mathematics tutoring has emerged as an effective strategy to support student achievement in mathematics. A meta-analysis of out-of-school-time tutoring programs indicated that those agencies offering online mathematics tutoring had a larger effect size than agencies offering only face-to-face mathematics services (Chappell et al., 2011). A study by Beal et al. (2007) revealed that students showed significant improvement on mathematics problems after receiving online, interactive tutoring. The gains were experienced only in skills for which students received tutoring, as Beal et al. (2007) included problems with nontutored skills as control items in their analyses. These findings support other promising results that suggest that students benefit from online, real-time mathematics tutoring (Carnegie Learning, 2002; Nguyen & Kulm, 2005). More importantly for the current study, results from such studies have revealed that students struggling with mathematics achievement benefit the most from online mathematics tutoring (Maloy, Razzaq, & Edwards, 2014; Beal et al., 2007).

Research indicates that online mathematics tutoring should be consistent in order for participants to experience significant gains in achievement. However, the time investment required to achieve these gains is not substantial. Clark and Whetstone (2014) found that students who spent "as little as 50 minutes

per week" (p. 465) participating in online mathematics tutoring experienced an effect size of .68—equivalent to more than two thirds of a year's worth of improvement. Even more impressive are the results from a study of middle school students that found that more intensive tutoring at five hours per week for a 6-week period resulted in an average gain of an entire grade level in mathematics for participating students (eSchool News, 2009). In addition to employing tried-and-true, research-based traditional tutoring strategies, most online mathematics tutoring efforts also take place during the school day, often in a pull-out approach—a reality that baffles out-of-school-time tutoring proponents but has proven effective nonetheless.

Relevance of the Study and Research Questions

This study adds to the body of knowledge surrounding online mathematics tutoring by exploring how outcomes of tutored middle school students compare to those of students exposed only to their schools' business-as-usual mathematics instruction. The results are intended to provide sound, statistical evidence of the impact of mathematics tutoring, a need identified in the literature (Ritter et al., 2009, Baker et al., 2006). We addressed the following research questions in this study: (1) How does online mathematics tutoring affect mathematics scores of low achieving students? (2) What are students' perceptions of online mathematics tutoring services? (3) How do online mathematics tutors describe their pedagogical practices and student learning?

Methods

We employed a mixed methods approach, using quantitative methods to address the tutoring's impact on mathematics scores and qualitative methods to examine tutor and student commentary on the services. We used a quasi-experimental, pretest/posttest design (Leedy & Ormrod, 2010) to analyze within-group changes in achievement scores for participating students, with separate analyses conducted for each school. Additionally, we conducted a causal comparative matched sample design to compare tutored students' achievement to that of nontutored students in School 1. Model-guided and inductive-coding qualitative techniques were used to analyze tutor descriptions of their online tutoring practice and student perceptions of the program (Zhang & Wildemuth, 2009).

Participants

Students from two middle schools participated in this study. School 1 is a large rural school in southern Virginia, and School 2 is a large rural school in central Kansas. Both schools were also serving as pilot schools for a school-wide mathematics program, PTm, as part of an Investing in Innovation scale-up grant through the U. S. Department of Education. The tutoring occurred during Year 2 of the 5-year program.

All student participants in the study, both treatment and comparison, earned below passing scores on either the state standardized mathematics assessment for the 2012–2013 academic year (School 1), or failed the program's pretest assessment at the beginning of the 2013–2014 academic year (School 2). Forty-nine Grade 6 students from School 1 and 70 Grade 7 and 8 students from School 2 received tutoring during the 2013–2014 academic year. Students began receiving services in October 2013 and attended tutoring twice a week for 20 weeks. An additional 292 Grade 6 students in School 1 who did not receive tutoring services were included in the between-group analyses for that school.

Attendance records indicated that participants in School 1 attended an average of 28 sessions that were 30 minutes in length. On average, School 1 students received 14 hours of tutoring. Sixty tutors provided services for these students, with students working with six tutors on average throughout the program. Participants in School 2 attended an average of 38 sessions lasting 37 minutes per session, or about 23 hours of tutoring per student. A total of 61 tutors provided services for these students, with

students working with an average of 8 tutors over the duration of the program. Tutoring services were provided twice a week in pull-out fashion during normal math class time for participating students.

All students in both schools were exposed to the school-wide mathematics program, PTm. In School 1, all students also received remediation in core subjects in a tiered RTI style. No other services were offered to nontutored students in School 1. In School 2, only those nontutored students with identified disabilities received additional mathematics services; other nontutored students did not receive any additional instruction in mathematics.

Description of Services

For this study, online mathematics tutoring was provided by Focus EduVation (FEV), a program whose services include interactive tutoring for K-12 students. Tutoring was provided in a synchronous, one-to-one online environment using chat, instant messaging, and virtual whiteboard technology. Grounded in principles of effective remediation for students with mathematics difficulties, the program focuses on individualized progress monitoring to design and adjust tailored interventions (Fuchs et al., 2011). Diagnostic assessments were administered to participating students before tutoring began to allow program and school personnel to develop individualized learning objectives for each student. Based on these learning objectives, a learning plan was created for each student. Learning plans were aligned with the school's curricular standards and scope and sequence to ensure that the services met the student's and school's specific needs. The learning plans served as the foundation for the tutoring but were flexible enough to accommodate minor changes over the duration of the program. Overall, the tutoring was intended to provide a differentiated, engaging environment where skills were enhanced through sharing of curricular materials, practice problems and visuals, and graphic features to aid communication and collaboration between students and tutors. Shared communication was focused on providing students who struggle with mathematics with expert instructional explication to promote lateral transfer and schema development (Brown et al., 1992; Gick & Holyoake, 1983). Tutors providing services were required to have a minimum of a 4-year degree and 2 years teaching or tutoring experience, and underwent background checks to ensure a safe environment. In-session assessments allowed tutors to assess student progress by specific skill in a formative manner, and posttests allowed for an examination of students' overall growth.

Data Sources

We used scores from the 2013 and 2014 administrations of the Virginia Standards of Learning (SOL) assessment for participating students as pretest and posttest for School 1 and program-administered pretests and posttests for School 2 (state-level assessments were unavailable for School 2 due to a moratorium on testing in 2014).

Additionally, we examined tutor-generated summaries of each online tutoring session, as well as responses to open-ended items from students that solicited their perceptions of the tutoring services. These summaries and responses were used to explore themes related to tutor practices and student perceptions of the tutoring they received. These data were collected by the tutoring agency and provided to us through a data use authorization with the two schools.

Analytic Approach

We conducted paired samples *t*-tests for each school using pretreatment and posttreatment scores to determine within-group changes in each school. Tutored students in School 1 were also matched with nontutored students (see matching procedures below), and between-group differences were examined using an analysis of covariance (ANCOVA). We also computed Cohen's *d* within-group effect-size

estimates for tutored and comparison students using the correction for dependence method (Morris & Deshon, 2002).

Matching procedures. The propensity score matching approach (Guo & Fraser, 2010) was used to match the Grade 6 tutored students in School 1 with nontutored students. A total of 407 students were enrolled in Grade 6 mathematics and were included in the initial matching procedures. Sixty-six students were removed from the sample because they did not have achievement scores for both 2013 and 2014. Ultimately, 341 students were included in the matching procedures, with 49 in the treatment group and 292 in the comparison group.

Propensity scores were estimated by the predicted probabilities of a logistic regression model (Guo & Fraser, 2010) with the tutoring status as the criterion variable and the following covariates serving as predictor variables: minority status, economically disadvantaged status, disability status, student in recovery status, gender, and 2013 SOL scaled score. Student demographics were those assigned by the division/state. Descriptions are as follows: minority status, all students not categorized as White (Black or African American, Hispanic, and multiracial); economically disadvantaged, students eligible for free or reduced-price lunch; disability status, any student identified with a learning, physical, emotional, behavioral, or mental disability; and student in recovery status, any student who has participated in a remediation program.

The overall model fit of the logistic model was supported, $\chi^2(8, N = 341) = 14.76$, $p = .07$. The 1-to-2 nearest neighbor matching approach (Guo & Fraser, 2010) was utilized to match each tutored student with two nontutored students with the smallest absolute differences of the estimated propensity scores. As a result, 49 tutored students were matched with 98 nontutored students.

Prior to the matching procedure, the tutored and the nontutored groups differed significantly on the minority, economically disadvantaged, recovery, and 2013 achievement scores predictors (see Table 1). After the matching procedure, the tutored students were statistically equivalent to the nontutored students on all covariates except the recovery predictor and the baseline achievement score, with the nontutored group having more students in recovery and a higher mean 2013 SOL scaled score (see Table 2). The overall group equivalencies improved with the propensity score matching, and we proceeded with the analyses using the recovery indicator and the 2013 mean SOL scaled score as covariates in our ANCOVA to control for the pretreatment differences.

Table 1 *Covariate Descriptive Statistics and Equivalency Checks by Tutoring Status Before Matching (n = 341)*

Covariate	Tutored (overall $n = 49$)	Nontutored (overall $n = 292$)	Equivalency analysis
Minority	32	120	$\chi^2 = 9.96$*
Economically disadvantaged	37	161	$\chi^2 = 7.15$*
Disability	8	43	$\chi^2 = .09$
Recovery	32	63	$\chi^2 = 39.93$**
Female	27	155	$\chi^2 = .07$
2013 SOL Scaled Score	49 ($m = 383.08$)	292 ($m = 468.97$)	$t = 15.72$**

*Statistically significant at the .01 level

**Statistically significant at $p < .001$

Table 2 *Covariate Descriptive Statistics and Equivalency Checks by Tutoring Status After Matching (n = 147)*

Covariate	Tutored (overall *n* = 49)	Nontutored (overall *n* = 98)	Equivalency analysis
Minority	32	59	$\chi^2 = 0.36$
Economically disadvantaged	37	74	$\chi^2 = 0.00$
Disability	8	21	$\chi^2 = 0.54$
Recovery	32	44	$\chi^2 = 5.45$*
Female	27	45	$\chi^2 = 1.10$
2013 SOL Scaled Score	49 (*m* = 383.08)	98 (*m* = 406.90)	*t* = 5.42**

*Statistically significant at the .05 level

**Statistically significant at $p < .001$

To address Research Questions 2 and 3, we analyzed 84 tutor-generated session summaries and 84 postsession commentaries by students across both schools. These data were analyzed using NVivo, a qualitative data analysis software program that enables users to create a flexible node structure where similar data may be coded throughout analysis to assist in the iterative construction of categories and themes (Patton, 2002). Both model-guided and inductive coding were employed in the analysis (Zhang & Wildemuth, 2009). Analysis of tutor summaries of online sessions was guided by practice components of the tutoring model and the literature on pedagogical strategies for mathematics remediation. Student comments were analyzed to identify students' emic perceptions of the program. The codebooks developed for analyses of tutor and student comments appear in Appendix A.

Several strategies were employed to enhance the trustworthiness of findings emerging from this process: (a) two researchers analyzed each data source; (b) researchers met frequently to establish, clarify, and revise codes and categories; (c) an electronic audit trail was maintained; (d) a program model provided referential adequacy; and (e) findings were contextualized within the broader literature on mathematics learning and pedagogy (Shenton, 2004). These strategies extend the credibility, confirmability, transferability, and dependability of the findings. Further, representativeness indices were calculated to provide information about the extent to which themes emerged across individuals, and how prevalent each was throughout the discourse. These indices provided context related to the number of sources with statements coded to each theme at least once, and the salience of themes in terms of the number of references generated across participants accruing to a single code.

Results

Within-Group Outcomes in Schools 1 and 2

Scores on the program-administered pretests indicated that participating students in each school had below-passing averages. School 1 had no students with passing averages on pretest assessments and no students with passing scaled scores on the prior year's mathematics SOL. School 2 also had no students with passing averages on the program administered pretest assessments.

At the end of the program, 30 (61.2%) of the School 1 students had passing scaled scores on the mathematics SOL. Before exposure to the program, the mean score for participating students in School 1 on the 2013 Virginia SOL mathematics assessment was 383.08, below the proficiency cut score. The average score on the Virginia 2014 SOL mathematics assessment for the same students in School 1 was 405.96, which is above the 400 cut score for proficiency in Virginia (Virginia Department of Education, 2012). Within-group differences from pre-intervention to postintervention for School 1 showed

significant improvement in scores for the group, with a mean improvement of 22.88 points ($t = 5.99$, $p < .001$). Within-group effect-size estimates for School 1 were $d = +0.95$ for tutored students.

At the end of the program, 15 (30%) of the tutored students in School 2 had passing averages on program-administered posttests. Although the posttest average for School 2 was below the passing level ($M = 53.03$), students in School 2 did show significant improvement in achievement, with a mean gain of 26.16 points ($t = 10.11$, $p < .001$). The within-group effect-size estimate for tutored students in School 2 was $d = +1.47$.

Table 3 reports pretreatment and posttreatment means, mean differences, and probability values for both schools. Figures 1 and 2 illustrate the gains in achievement for each school.

Table 3 *Paired-Samples Results for Mean Outcome Scores by School*

	n	Pretest mean *(SD)*	Posttest mean *(SD)*	Mean difference	*p*
School 1	49	383.08 (11.31)	405.96 (26.36)	22.88	< .001
School 2	50	26.87 (11.68)	53.03 (16.76)	26.16	< .001

Figure 1. Comparison of pre- and posttreatment scores for students receiving services in School 1.

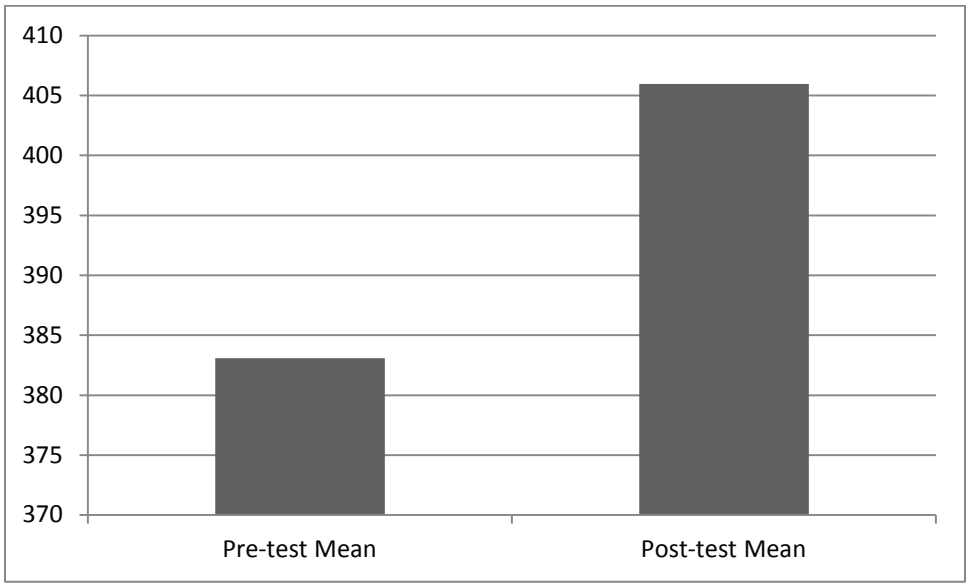
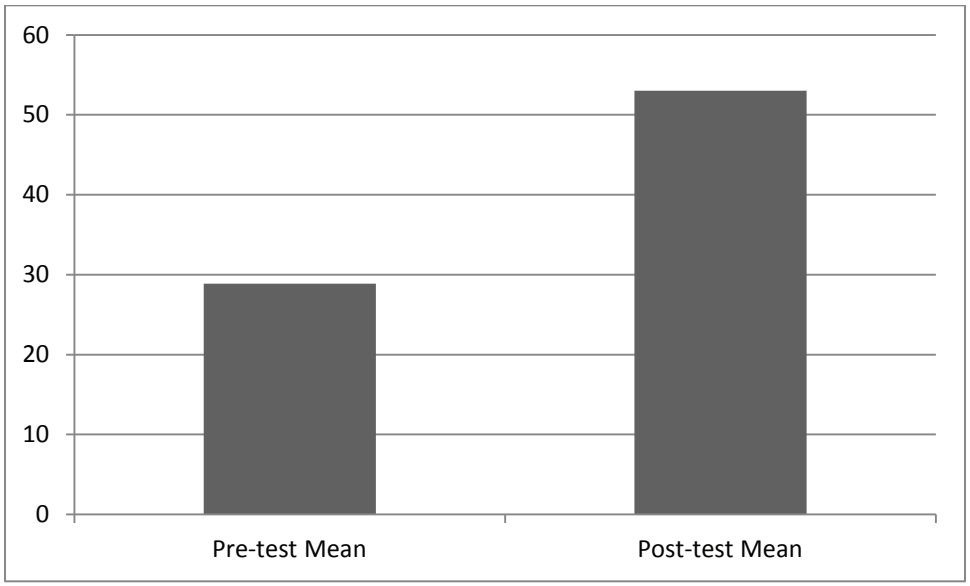


Figure 2. Comparison of pre- and posttreatment scores for students receiving services in School 2.



Between-Group Outcomes in School 1

The ANCOVA indicated nonsignificant differences between the 2014 SOL scaled posttest scores for the tutored group and the matched, nontutored group, $F = 1.66$ (*1,144*), $p = .20$. This means that the nontutored group's statistically significantly higher baseline score advantage was narrowed postintervention, after controlling for recovery status and 2013 SOL scaled score. It is worth noting, however, that both groups had statistically significant within-group increases in scores from pretest to posttest, indicating significant growth for both groups (within-group results for comparison group: $t = 2.35$, $p = .02$). Within-group effect-size estimates for School 1 were $d = +0.95$ for tutored students, and $d = +0.24$ for nontutored students. Table 4 reports between-group comparisons by treatment status.

Table 4 *Analysis of Covariance for Outcome Scores for School 1*

	Pretest mean* (*SD*)	Observed posttest mean (*SD*)	Adjusted posttest mean (*SE*)	*F*	*p*
Tutored students	383.08 (11.31)	405.96 (26.36)	409.28 (5.74)	1.66	.20
Comparison students	406.90 (40.48)	424.20 (65.95)	422.54 (8.26)		

*Pretest mean difference between tutored and comparison students was statistically significant at the .001 level.

Tutoring Descriptions

Tutor-session log data across both sites revealed that almost all tutors discussed implementing pre- and postassessments of student learning during each session, and analyzed these data to guide the instruction provided in the session. Many of the tutors also provided descriptions of their reflections on student learning during independent practice, and provided individualized differentiation as needed. Almost all tutors described the delivery of guided practice to students, and many discussed the use of multiple explanations and representations of target concepts. Tutors described interventions focused on accessing prior knowledge, modeling ("showed him how to multiply the decimal number with example"), explaining the steps in mathematical processes ("explained all the five steps to find the square root of the irrational numbers"), identifying both process and operational errors ("another problem of similar kind was worked by the student with minor mistakes, which she corrected on tutor's advice"), and scaffolding through the use of questions or prompts ("tutor helped the student by providing hints to get the right answer").

Tutor reflections on student learning were prevalent throughout the summaries and included articulation of student's postlesson content mastery, session scores, and identification of prior knowledge that was necessary for success. Identification of various types of student difficulties as well as leverage points for further instruction were often present, as exemplified by the following tutor comments: "The student struggled with multiplying the decimals, but corrected himself and was fast while learning," and "Student was able to translate the given image and could reflect the image over different axis on the coordinate plane with ease."

Student Perceptions

Analysis of student postsession commentary on the tutoring sessions revealed both positive and negative perceptions. Positive comments outnumbered negative comments by a ratio of three to one. Most of the positive student commentary was general in nature, expressing gratitude for the assistance, a fondness for the tutor, or social greetings. The general nature of student responses is not surprising given the age of students and the open-ended nature of the prompt to simply comment on the session. However, even within this unstructured environment, approximately 40% of students spontaneously indicated that they found the session to be helpful for their mathematics learning, and about a quarter of students identified specific learning outcomes of the session. For example, one student commented, "Good session—now I understand integers." Another noted, "Now I get irrational numbers and rational numbers." A smaller percentage of students made specific statements indicating they left the session feeling more confident in the material, as the following comments illustrate: "He made it seem so easy, because it is," and "It is easy once you learn it."

Student negative commentary about the tutoring sessions was far less frequent than positive commentary, but was often more specific in nature. The two most prevalent themes of negative response to tutoring were related to pacing of the sessions, and the desire for more explanation. Students who made comments about pacing were far more likely to say the session went too slow rather than too fast. Due to the general nature of much of the commentary, it was unclear whether this related primarily to the speed of connection or to the actual pedagogical pacing. However, some students did specifically articulate that too much time was spent on tutor explanation and not enough on student work. For example, one student noted, "He doesn't let me work out the problem even when he tells me to solve it on my own." Of students who did desire more explanation, there was a desire for greater clarity of explanation, as expressed by the following student: "This tutor was great, just needs to work on explaining a little bit more and showing his work more clearly."

Findings and Discussion

The findings of this study suggest that well-designed-and-implemented synchronous online mathematics tutoring may be an effective Tier 3 intervention for students in high-need settings who are struggling with mathematics. Our findings support the extant literature on online mathematics tutoring and provide further evidence that the strategy can be successful in improving mathematics achievement of underperforming middle school students when compared to their nontutored peers. Although the propensity score matched comparison analysis did not reveal a statistically significant difference in the adjusted means between tutored and nontutored students, within-group effect-size estimates indicated a large relative advantage for tutored students in School 1 (d = +0.95 for tutored versus d = +0.24 for nontutored students), and a large absolute gain for tutored students in School 2 (d = +1.47). It is worth noting that these results were observed in a context where the schools were implementing a well-resourced and proven instructional model that addresses Tier 1 and Tier 2 RTI supports.

Tutor-described practices suggested good fidelity of implementation of the model and alignment with the literature. Almost all tutors discussed the use of formative assessments of student learning before, during, and after each session to guide the instruction provided in the session and set goals for future sessions. These findings are consistent with the goals of the program studied here as well as the literature on the benefits of systematic, ongoing progress monitoring as a core principle of effective remediation for students who struggle with mathematics (Fashola, 1998; Fuchs et al., 2011). Tutors described the delivery of guided practice to students, and many discussed the use of multiple explanations and representations of target concepts. These approaches described by tutors are consistent with literature in the field that links instructional explanations and representations with development of student mathematics understanding (Charalambos et al., 2011; Fuchs et al., 2011; Hiebert et al., 1997).

These qualitative findings point to some of the mechanisms at work behind the achievement results and suggest some specific directions for practice in online mathematics tutoring as a Tier 3 intervention. Specifically, these tutors described attending assiduously to student pre- and postdata to guide their instructional moves, and to providing multiple scaffolded opportunities for the students to engage with the mathematics at their individual levels. Session tutoring logs contained evidence of articulation of the student's postlesson content mastery; identification of the student's individual difficulties; descriptions of the student's learning behaviors; reflection on the student's mathematical understanding during the lesson; and recommendations for future teaching/learning. Online tutoring programs might consider incorporating specific prompts in each of these areas for tutors to respond to postsession, to help ensure all of these components are systematically addressed in each session.

Student commentary further supported the use of online mathematics tutoring that is data driven, individualized, and focused as a Tier 3 intervention for students who struggle. Although a great deal of the student postsession commentary was general in nature, it was overwhelmingly positive. More importantly, even within the context of a fairly unstructured prompt, some students identified specific learning outcomes of the sessions. This suggests that online mathematics tutoring that embeds consistent progress monitoring may engage students in thinking about their own mathematics learning as a process for enhancing achievement. A possible implication for practice is to consider how to include specific prompts for students to co-reflect on their learning with their online tutors. For example, online tutoring sessions might conclude with a prompt for students to identify what they learned that session and to explain how they know they learned this, providing students with the opportunity to think about their own mathematical understanding and the tutors with a window into student thinking.

Student perceptions of the pacing of online tutoring were mixed, which is possibly a function of the wide variety of reasons students may be assigned to a Tier 3 mathematics intervention. For example, for some students the achievement gap may be due to processing issues, and thus may require more explanation, while for others, attention-related issues may demand a faster pace. Furthermore, the

expressed desire on the part of at least some students for more time to work out problems on their own resonates with the literature that describes tutoring effectiveness as a function of knowing how to employ strategic questioning before telling or giving answers to students (Donnelly, 2013). Similarly, a number of students expressed the desire for more autonomy in the online tutoring process, from the desire to move faster or slower, to work more independently or with more support, and to select a preferred tutor for each session. These are ideas that are valuable to consider in developing online tutoring platforms, particularly for middle school students who are typically in a location along the developmental trajectory that makes choice and control of learning especially desirable (Midgley, Anderman & Hicks, 1995).

It is also important to note that students participating in this study were among the lowest performing students in two high-need rural middle schools with large numbers of students living in poverty. These are among the most underrepresented students in advanced STEM study and careers (Avery, 2013; Eick et al., 2007; Suresh, 2011) and the least likely to possess the mathematics confidence that motivates sustained engagement, persistence, and learning in the discipline (Perez, Cromley, & Kaplan, 2014; Singh, Granville, & Dika, 2002). Yet close to half the students indicated that they believed they learned during the tutoring session, a quarter identified a specific learning outcome, and some made detailed comments directly expressing their own increased confidence in their ability to understand and learn math. These findings suggest that for this particular population of students, the highly individualized and explicit nature of the tutoring support may have resulted in affective changes that are related to mathematics engagement and learning. The online nature of the program made this support available to students in isolated rural communities with comparatively limited access to resources for providing this type of focused, individualized instruction. Exploration of this theme and the impact of online tutoring programs that embed explicit schema-broadening instruction and systematic progress monitoring on students who have not traditionally succeeded with mathematics nor been well represented in higher level STEM study and careers is an area for further research.

Limitations

It should be noted that the study did not randomly assign equivalent students to the treatment condition, so it is not possible to definitively attribute outcomes to the tutoring program. Further, the generalizability of the results is limited in that both samples were comprised of very low-performing students from rural populations, and both schools were already engaged in a substantial school-wide mathematics instruction improvement initiative. Notwithstanding these caveats, this study provides promising evidence that a well-designed-and-implemented synchronous online tutoring program can augment the effectiveness of a robust, research-proven classroom model of mathematics instruction.

References

Avery, L. M. (2013). Rural science education: Valuing local knowledge. *Theory Into Practice 52*(1), 28–35.

Baker, J., Rieg, S., & Clendaniel, T. (2006). An investigation of an after school math tutoring program: University tutors + elementary students = a successful partnership. *Education, 127*(2), 287–293.

Beal, C., Walles, R., Arroyo, I., & Woolf, B. (2007). On-line tutoring for math achievement testing: A controlled evaluation. *Journal of Interactive Online Learning, 6*(1), 43–55.

Bray, M. (1999). *The shadow education system: Private tutoring and its implications for planners. Fundamentals of Educational Planning Series, Number 61.* Paper presented at the United Nations Educational, Scientific Cultural Organization, Paris International Institute for Educational Planning.

Bray, T. M. (2011). *The challenge of shadow education: Private tutoring and its implications for policy makers in the European Union* (pp. 1–78). European Commission.

Brown, A. L., Campione, J. C., Webber, L. S., & McGilly, K. (1992). Interactive learning environments: A new look at assessment and instruction. In B. R. Gifford & M. C. O'Connor (Eds.), *Changing assessments: Alternative view of aptitude, achievement, and instruction* (pp. 37–75). Boston: Kluwer Academic.

Burns, M. K., Senesac, B. V., & Symington, T. (2003). The effectiveness of the hosts program in improving the reading achievement of children at-risk for reading failure. *Literacy Research and Instruction, 43*(2), 87–103.

Carnegie Learning. (2002). Results from Moore, OK. *Cognitive Tutor Research Report OK-01-01.* Pittsburgh, PA.

Chappell, S., Nunnery, J., Pribesh, S., & Hager, J. (2011). A meta-analysis of supplemental educational services (SES) provider effects on student achievement. *Journal of Education for Students Placed at Risk, 16,* 1–23.

Charalambos, C. Y., Hill, H. C., & Ball, D. L. (2011). Prospective teachers' learning to provide instructional explanations: How does it look and what might it take? *Journal of Mathematics Teacher Education, 14,* 441–463.

Clark, A., & Whetstone, P. (2014). The impact of an online tutoring program on mathematics achievement. *The Journal of Educational Research, 107*(6), 462–466.

Cohen, P., Kulik, J., & Kulik, C. (1982). Educational outcomes of tutoring: A meta-analysis of findings. *American Educational Research Journal, 19*(2), 237–248.

Cooper, G., & Sweller, J. (1987). Effects of schema acquisition and rule automation on mathematical problem solving transfer. *Journal of Educational Psychology, 79,* 347–362.

Donnelly, R. (2013). The role of the PBL tutor within blended academic development. *Innovations in Education and Teaching International, 50*(2), 133–143.

Eick, C. J., Ewald, M. L., Richardson, V. B., & Anderson, K. (2007). Building a leadership network supporting science education reform in rural east Alabama. *Science Educator 16*(1), 8–12.

eSchool News. (2009). *Online tutoring program enhances students' skills.* Retrieved online from http://www.eschoolnews.com/2009/06/08/online-tutoring-program-enhances-students-skills

Fashola, O. (1998). *Building effective afterschool programs.* Thousand Oaks, CA: Corwin Press.

Fuchs, L. S., Powell, S. R., Seethaler, P. M., Cirina, P. T., Fletcher, J. M., Fuchs, D., & Hamlett, C. L. (2011). The development of arithmetic and word-problem skill among students with mathematics disability. In J. M. Kauffman, & D. P. Hallahan (Eds.), *Handbook of special education* (pp. 703–715). New York: Routledge.

Gick, M. L., & Holyoake, K. L. (1983). Schema induction and analogical transfer. *Cognitive Psychology, 15,* 1–8.

Gordon, E. (2003). Looking beyond the stereotypes: Ensuring the true potential of tutoring. *Phi Delta Kappan, 84*(6), 456–459.

Guo, S., & Fraser, M. W. (2010). *Propensity score analysis: Statistical methods and applications.* Thousand Oaks, CA: SAGE Publications.

Hiebert, J., Carpenter, T., Fennema, E., Fuson, K., Wearne, D., Murray, H., … Human, P. (1997). *Making sense: Teaching and learning mathematics with understanding.* Portsmouth, NH: Heinemann.

Huang, M. H. (2013). After-school tutoring and the distribution of student performance. *Comparative Education Review, 57*(4), 689–710.

Koerwer, S. (2007). ThinkingStorm: The ABCs of online tutoring. *Information Today, July/August 2007.*

Kroesbergen, E. H., & Van Luit, J. E. H. (2003). Mathematics interventions for children with special needs: A meta-analysis. *Remedial and Special Education, 24,* 97–114.

Kulik, J. A. (2003). *Effects of using instructional technology in elementary and secondary schools: What controlled evaluation studies say.* SRI project Number P10446.001. Arlington, VA: SRI International.

Leedy, P., & Ormrod, J. (2010). *Practical research: Planning and design* (9th ed.). Upper Saddle River, NJ: Pearson Education.

Maloy, R., Razzaq, L., & Edwards, S. (2014). Learning by choosing: Fourth graders use of an online multimedia tutoring system for math problem solving. *Journal of Interactive Learning Research, 25*(1), 51–64.

Midgley, C., Anderman, E., & Hicks, L. (1995). Differences between elementary and middle school teachers and students: A goal theory approach. *Journal of Early Adolescence, 15*, 90–113.

Morris, S., & DeShon, R. (2002). Combining effect-size estimates in meta-analysis with repeated measures and independent-group designs. *Psychological Methods, 7,* 105–125.

Nguyen, D., & Kulm, G. (2005). Using web-based practice to enhance mathematics learning and achievement. *Journal of Interactive Online Learning, 3,* 1–16.

Nunnery, J., Chappell, S., & Arnold, P. (2013). A meta-analysis of a cooperative learning model's effects on student achievement in mathematics. *Cypriot Journal of Educational Sciences, 8*(1), 34–38.

O'Connor, R. E., & Sanchez, V. (2011). Responsiveness to intervention models for reducing reading difficulties and identifying learning disability. In J. M. Kauffman & D. P. Hallahan (Eds.), *Handbook of special education* (pp. 703–715). New York: Routledge.

Patton, M. (2002). *Qualitative research and evaluation methods.* Thousand Oaks, CA: Sage Publications.

Perez, T., Cromley, J., & Kaplan, A. (2014). The role of identity development, values, and costs in college STEM retention. *Journal of Educational Psychology, 106*, 315–329.

Ritter, G., Barnett, J., Denny, G., & Albin, G. (2009). The effectiveness of volunteer tutoring programs for elementary and middle school students: A meta-analysis. *Review of Educational Research, 79*(1)*,* 3–38.

Rothman, T., & Henderson, M. (2011). Do school-based tutoring programs significantly improve student performance on standardized tests? *RMLE Online: Research in Middle Level Education, 34*(6), 1–10.

Sanderson, D. (2003). Setting up a successful after school tutorial program: One district's journey. *Reading Improvement, 40*(1), 13–20.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information, 22,* 63–75.

Singh, K., Granville, M., & Dika, S. (2002). Mathematics and science achievement: Effects of motivation, interest, and academic engagement. *The Journal of Educational Research 95*(6), 323–332.

Slavin, R. E. (1995). *Cooperative learning: Theory, research, and practice.* Boston, MA: Allyn and Bacon.

Suresh, S. (2011, January 7). *The changing science, technology, engineering and mathematics (STEM) workforce.* Paper presented at the President's Council of Advisors on Science and Technology, Washington, DC. Retrieved from http://www.todaysengineer.org/2011/Mar/STEM-Workforce.asp

Topping, K. (2000). *Tutoring.* Brussels, Belgium: International Academy of Education.

Vasquez, E., III, & Slocum, T. (2012). Evaluation of synchronous online tutoring for students at risk of reading failure. *Exceptional Children, 78*(2), 221–235.

Virginia Department of Education. (2012). *Virginia standard of learning assessments: Technical report. 2011–2012 Administration cycle.* Richmond, VA: Author.

Wasik, B. (1998). Using volunteers as reading tutors: Guidelines for successful practices. *Reading Teacher, 51*(7), 562–570.

Zhang, Y., & Wildemuth, B. M. (2009). Qualitative analysis of content. In B. M. Wildemuth (Ed.), *Applications of social research methods to questions in information and library science* (pp. 308–319). Westport, CT: Libraries Unlimited.

Appendix A

Table A1
Codebook for Student Tutoring Session Comments

Category	Codes	Examples
Social interaction with tutor	1. Statements expressing thanks for the session 2. Statements expressing a general positive attribution to the session or tutor 3. Social greetings	1. "Thanks for working with me." 2. "I love your teaching." 3. "Talk to you on Tuesday."
Learning benefits	1. Statements indicating the student found the tutor to be helpful to them 2. Statements that the student constructed a specific mathematical understanding 3. Statements indicating student left session feeling confident about material 4. Statements that the student liked the website or tools	1. "He worked with me really well. He was nice and helped me a lot." 2. "Good session I now understand integers." 3. "Now I get irrational number and rational numbers." 4. "He made it seem so easy, because it is" 5. "I like the white board."
Learning challenges	1. Pacing is too slow 2. Pacing is too fast 3. Desired more explanation/clarification 4. Desired more active participation 5. Problems with website and/or connectivity	1. "Very slow, pick up the pace." 2. "I feel like this is helping me but I also feel like my tutor rushes me." 3. "The tutor was great, just needs to work on explaining a little bit more, and showing his work more clearly." 4. "It was good but he needs to let me do some work by myself." 5. "At one point the thing didn't let me type that's why I took so long."

Table A2

Codebook for Analysis of Online Math Tutor Logs

Categories	Codes	Illustrative language
Assessment of student's prior knowledge	1. Analysis of pretest data	1. Posted the pretest questions for the student to solve. The test consisted of 10 problems. [Student] attempted 8 problems, and solved 5 of them correctly. Student was not familiar with concept of Pythagorean theorem.
Online tutoring interventions to support student understanding	1. Accessing prior knowledge 2. Modeling 3. Explaining steps in mathematical processes 4. Pointing out student mistakes to the student 5. Providing scaffolding through questioning or prompts	1. Started session by giving warm-up problem on dividing decimals with whole number. 2. Showed him how to multiply the decimal number with example. 3. Explained all the five steps to find the square root of the irrational numbers. 4. Another problem of similar kind was worked by the student with minor mistakes, which she corrected on tutor's advice. 5. Tutor helped the student by providing hints to get the right answer.
Tutor reflection on student learning	1. Articulation of student's postlesson content mastery 2. Identification of student difficulties, mathematics 3. Identification of technological issues impacting learning 4. Description of student learning behaviors 5. Reflection on student mathematical understanding during lesson 6. Recommendations for future teaching/learning	1. Attempted eight problems and solved five of them correctly. He scored 50% in the session. 2. The student faced difficulty in multiplying and adding the numbers. 3. The student struggled with writing on the whiteboard. 4. The student struggled with multiplying the decimals, but corrected himself and was fast while learning. 5. Student was able to translate the given image and could reflect the image over different axis on the coordinate plane with ease. 6. He needs more practice in multiplication of fractions.

Real-Time Virtual Teaching: Lessons Learned From a Case Study in a Rural School

Michael K. Barbour

Sacred Heart University

Abstract

Due to the challenges facing rural schools, many jurisdictions have resorted to the use of virtual school programs to provide curricular opportunities to their students. While the number of virtual schools that rely on synchronous instruction as a primary or significant method of delivery is quite small, there are some programs that do (and a growing number of virtual schools that use it with small groups or individuals). This case study examined the use of synchronous online instruction by one virtual school with students in a single rural school in Newfoundland and Labrador. The data from a variety of collection methods revealed three themes: similarities with online student experiences and their traditional classroom experiences, the development of local learning communities, and the preference for students to use chat over audio.

Introduction

In 1978, Cosby and McDermott indicated that there was a perception that those living in rural areas represented "a small and insignificant segment of the population" of the United States (p. 6). The authors speculated that this was due to urban dominance in matters of politics and commerce, along with a general shift in the population from rural to urban areas. These observations are still relevant 37 years later and are applicable not only to an American context, but in most rural jurisdictions throughout the world. They are particularly true of the Canadian Province of Newfoundland and Labrador, which is located on the east coast of Canada. The province, which has both island and mainland portions, has a total area of approximately 252,000 square miles and a population of a little less than 510,000 people at the time of this study. Although about half of the population resides within a 90-minute drive of the provincial capital, the remainder of the province is sparsely populated. In fact, at the time of this study, 192 of the 294 schools were located in these rural areas (Government of Newfoundland and Labrador,

2005), 85 of which were deemed "necessarily existent" (i.e., a school that cannot be closed because it is located so far from another school that busing is not feasible).

Based upon the recommendations of government reports (e.g., Crocker, 1989; Crocker & Riggs, 1979; House, 1986; Riggs, 1987), the province implemented a program of distance education for rural high school students in 1988. The main purpose of the program was to provide secondary level students with courses that were important for postsecondary admission but were difficult to offer in rural schools due to low levels of student enrollment. Following a ministerial panel (Sparkes & Williams, 2000), the government created the Centre for Distance Learning and Innovation (CDLI) to be founded upon the web-based, distance education model.

The purpose of this study was to explore how virtual schooling was being implemented in a Newfoundland and Labrador rural schools, specifically with regard to synchronous online instruction. I begin with a discussion of the literature related to K-12 online teaching, specifically research related to synchronous instruction. This is followed by a description of the case study methodology that was used to collect data at this rural school in Newfoundland and Labrador, including a detailed description of the synchronous model of instruction utilized by the virtual school (i.e., the CDLI). Next, I outline and discuss three themes that emerged in the data. Finally, I provide implications for practice and suggestions for future research.

Literature Review

There is a growing body of literature related to teaching in the K-12 online learning environment (Davis & Roblyer, 2005; DiPietro, 2010; DiPietro, Ferdig, Black, & Preston, 2008; Easton, 2003; Harms, Niederhauser, Davis, Roblyer, & Gilbert, 2006; Lowes, 2005; Morris, 2002; Rice, 2011; Roblyer & McKenzie, 2000; Smith, 2009). There are even untested national standards related to online teaching that have been adopted by several states (Barbour, Clark, DeBruler, & Bruno, 2014; International Association for K-12 Online Learning, 2011; North American Council for Online Learning, 2007). The vast majority of online instruction that occurs within the K-12 online learning environment is asynchronous in nature (Barbour, 2013; Barbour & Adelstein, 2013). In fact, there are only two K-12 online learning programs in North America that have been known to utilize a strong synchronous instructional model: the CDLI in Newfoundland and Labrador (see Barbour, 2007b) and, formerly, ACCESS Distance Learning in Alabama (see Roblyer, Freeman, Stabler, & Schniedmiller, 2007).

As the majority of K-12 online learning programs use a primarily asynchronous instructional model, there isn't as much known about synchronous instruction within virtual schooling. For example, Murphy and Coffin (2003) described the affordances and constraints of synchronous tools used by the CDLI as a part of its French as a second language courses from the perspective of student-to-teacher, student-to-student, and student-to-content interaction. Further, Murphy (2009) found that synchronous tools were useful in promoting speaking in blended, elementary level French as a second language courses, but that poor audio quality, the time lag, and students' preference for the chat feature were challenges that teachers faced. Additionally, Nippard and Murphy (2007) investigated how social presence was manifested in the CDLI's synchronous environment and found that teachers exhibited social presence through use of the audio feature in the virtual classroom environment, while students relied primarily on the text-based chat feature.

In their study of transactional distance with CDLI teachers, Murphy and Rodríguez-Manzanares (2008) found that to decrease the students' sense of transactional distance teachers needed to build rapport and community with their students. But they also found that the curriculum and teacher-centered tools (such as the learning management system) placed limitations on online teachers and that teachers needed to leverage their real-time interaction and engagement with students. *Transactional distance* is a

psychology or sense of distance experienced by the student in an online environment, and researchers have found that to decrease transactional distance, highly autonomous learners in an environment with a high level of dialogue and a low level of structure are needed (Moore, 1972, 1973, 1983, 1993; Moore & Kearsley, 1996). Further, Murphy and Rodríguez-Manzanares (2009a) reported that the nature of both synchronous and asynchronous tools forced online teachers with the CDLI to transition their practice to "more learner-centered, facilitative forms of teaching" (p. 14). This perception was also reported in a pan-Canadian study of online teachers from a variety of K-12 online learning programs (Murphy & Rodríguez-Manzanares, 2009b). Conversely, Murphy, Rodríguez-Manzanares, and Barbour (2011) found that online teachers in the synchronous environment actually relied more on teacher-focused rather than student-centered approaches. One of the reasons for this contradiction may be the difficulties that online teachers reported in developing rapport with the students—even using the synchronous tools that were available to them (Murphy & Rodríguez-Manzanares, 2012). Beyond the research into the CDLI and other Canadian jurisdictions, there has been little research into synchronous K-12 online teaching within North America.

Outside of the North American context, there are several jurisdictions that utilize synchronous instruction as a primary or significant component of their online teaching model (Barbour, 2014; Barbour, Brown et al., 2011; Barbour, Hasler Waters, & Hunt, 2011). For example, the various e-learning clusters of the Virtual Learning Network in New Zealand utilize a model in which most of the instruction is delivered to students using a synchronous video-conferencing system for one hour each week (Barbour & Bennett, 2013; Bennett & Barbour, 2012; Lai & Pratt, 2009; Pullar & Brennan, 2008; Roberts, 2009). However, beyond general descriptions, there has also been a lack of international research into the synchronous instructional model in the K-12 online teaching environment.

Methodology

The purpose of this study was to explore virtual schooling in a Newfoundland and Labrador rural school. Specifically, this study examined the following research question:

- What are the students' experiences during their synchronous time online?

As the research question was designed to understand students' experiences in a virtual high school by examining how those experiences operated at a particular rural school, a case study was the most appropriate methodology. Merriam (1998) indicates that a case study is designed to provide "an intensive, holistic description and analysis" of a specific phenomenon (p. 27). This is supported by Shank (2002), who describes the main purpose of a case study as providing an understanding of a unique case.

According to Merriam (1998), "Any and all methods of gathering data, from testing to interviewing, can be used in a case study, although certain techniques are used more than others" (p. 28). Those techniques usually include interviews, document analysis, and participant observation (Bassey, 1999; Merriam, 1998; Stake, 1995; Yin, 2003). Further, the use of multiple sources of data from multiple data-collection methods allows researchers to triangulate themes that may emerge from the data (Patton, 2002). The data collection for this study occurred over a 6-month period and began with a semistructured focus group, followed by monthly interviews for 5 months, and observations of students during their scheduled synchronous and asynchronous classes.

The data were analyzed using an inductive analysis approach, specifically the constant comparative method, which involves scanning the data for categories and relationships within individual transcripts and between transcripts (LeCompte & Preissle, 1993). As Ezzy (2002) described, the process of constant comparison consists of developing and identifying codes that can then be compared across the data. In particular, I used Ruona's (2005) four-stage process for the table format and the find and replace

feature of Microsoft Word to conduct a more systematic analysis of qualitative data. The four stages include preparing the data, familiarization of the data, coding the data, and generating meaning from the data (for a complete description of the methodology, see Barbour [2007a] and Barbour and Hill [2011]).

The Case

Beaches All Grade has approximately 100 students and a staff of 15 teachers. The students at Beaches All Grade came from three different communities: Beaches itself, Cape Random (approximately 7 miles south), and Clarke's Bay (approximately 7 miles north). During the 2005–2006 school year, there were 12 students enrolled in eight different CDLI courses (see Barbour [2007b] for a detailed description of the province of Newfoundland and Labrador, the challenges it has faced in providing educational opportunities in rural areas, and the history of distance education as a means to address that challenge—including the CDLI and the nature of its online learning experience).

Just as if you were to observe 10 classroom teachers teach a single lesson or a single teacher teach 10 lessons, you would see a wide variety of instructional approaches. This variety of the instructional practices of e-teachers during their synchronous lessons was apparent during the study. In addition, this synchronous component was also where most of the instruction actually occurred, as most of the asynchronous "instruction" was similar to an independent learning environment rather than actual instruction (Greenway & Vanourek, 2006).

Many e-teachers used the virtual classroom in much the same way that they would use a traditional classroom. For example, it was common for teachers to use the electronic whiteboard in a manner similar to how they would use a traditional whiteboard as a space to diagram new concepts as they were introduced to students (see Figure 1).

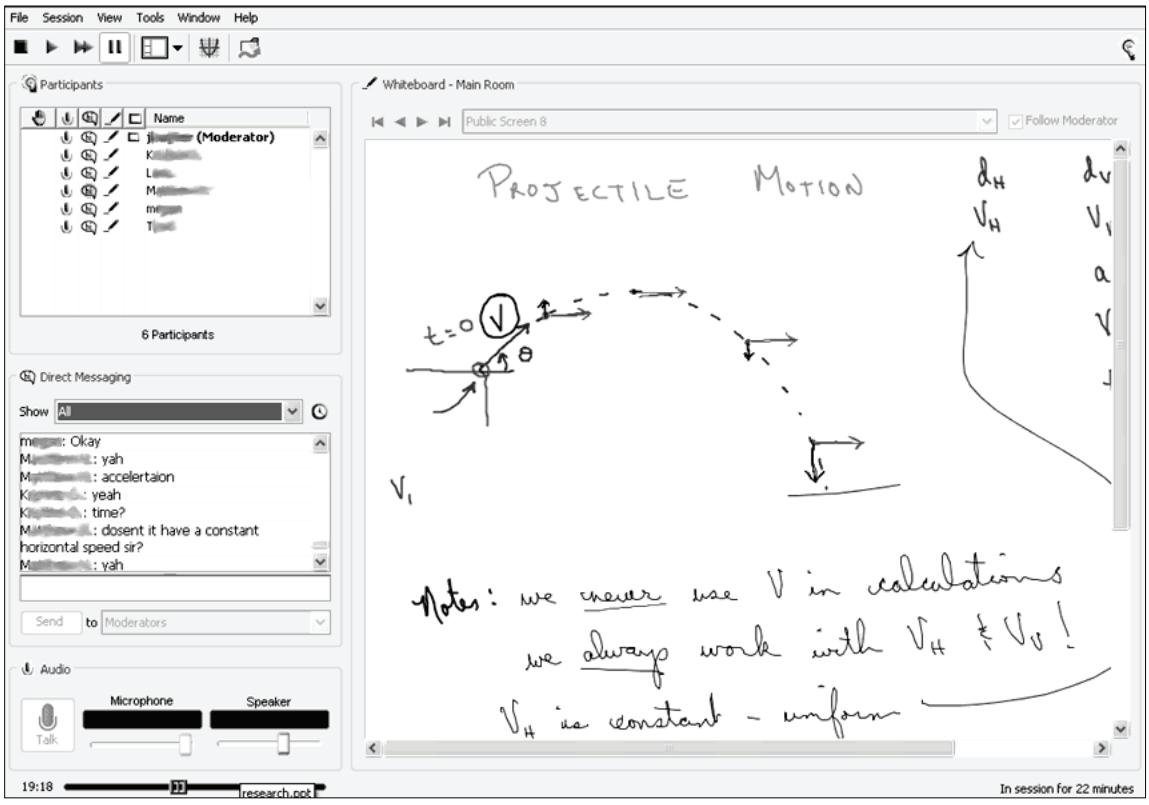


Figure 1. Example of a teacher introducing a new concept on the electronic whiteboard using Elluminate *Live!*

In this example, notice that the students used the direct messaging area to ask the e-teacher questions, and he addressed these questions as he introduced the concept. Unlike some virtual classrooms, the synchronous tool utilized by the CDLI allowed for only one individual to control the microphone at any given time. Because of this, e-teachers encouraged students to use the text-based chat or direct messaging (pictured near the bottom left in the screenshots), as it allowed students to interact with the e-teacher without the e-teacher having to release the microphone. It also allowed the e-teacher to address the students' questions while simultaneously conversing with the class.

It was also common for e-teachers, particularly in mathematics and the sciences, to use the whiteboard as a space to work out sample problems for the teachers (see Figure 2).

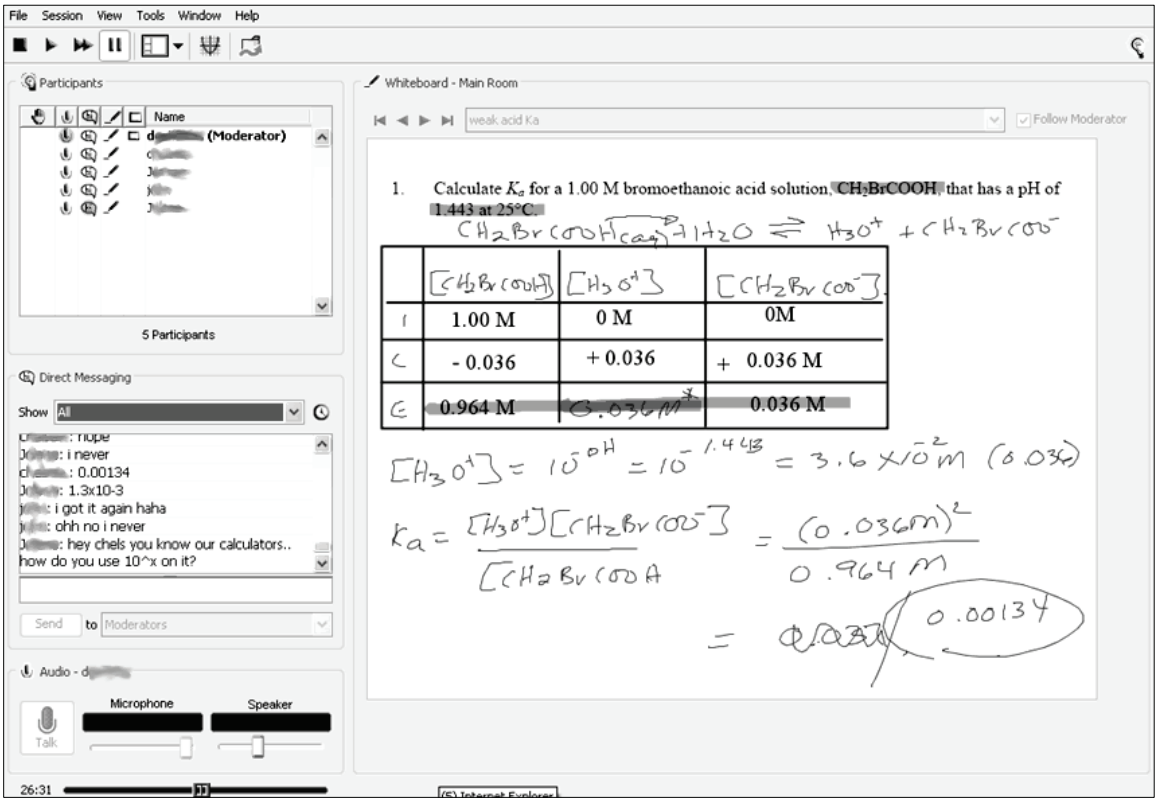


Figure 2. Example of a teacher working out sample problems using Elluminate *Live!*

Notice that in this example, the e-teacher asked the students to complete the calculations on their own and post them in the direct messaging area, prior to her writing the correct answer on the whiteboard. This was another way in which e-teachers encouraged interaction through the use of direct messaging.

Still other e-teachers used the whiteboard as a tool to deliver lectures, using it as a space to present notes and images—usually created using Microsoft PowerPoint (see Figure 3, next page). In this example, the e-teacher has turned off the public display of the direct messaging. This meant that students still had access to the direct messaging, but only the e-teacher was able to see what they wrote. This way the students were still able to ask the e-teacher questions or to let him know if they did not understand something, but they were not able to communicate with each other. It was in this synchronous environment within the CDLI that the current study occurred.

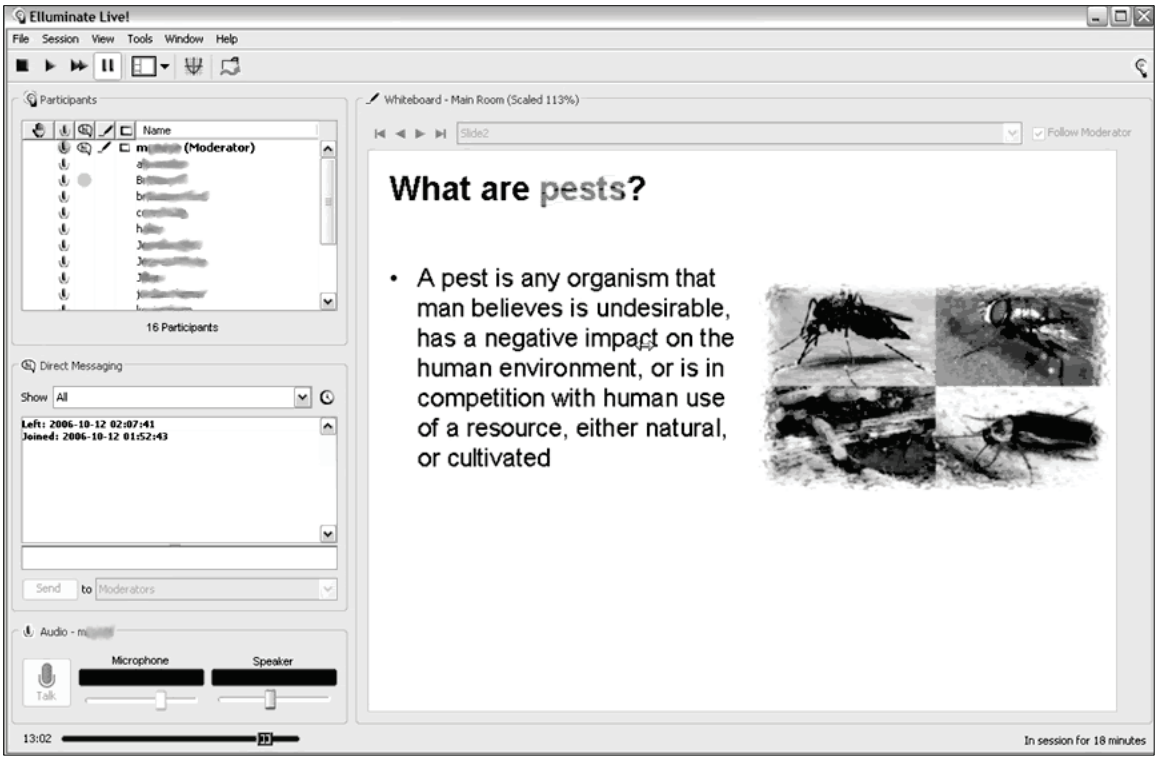


Figure 3. Example of a teacher lecturing with presentation slides using Elluminate *Live!*

Results and Discussion

The data revealed three main themes. First, the student experiences in the synchronous online learning environment were quite consistent with what one would expect of student experiences in a real-time face-to-face classroom. Second, a strong sense of community and a local online-learning support group developed among the students sitting in the room as they engaged in their synchronous online classes. Third, during their synchronous online classes, the students preferred to interact using the direct message or chat features, as opposed to the audio functions.

Students' Synchronous Experiences

In addition to the similarities found between what we might expect a classroom teacher to do in a traditional classroom environment and what the e-teachers did in the virtual classroom, there were also many similarities between how we would expect students to describe their experience in a traditional classroom and how students described their experiences during their synchronous class time. For example, one student described "just sitting there and listening to the teacher" (JD—n.b., all names are pseudonyms). While not evincing a very active form of participation, JD's quote at least indicated that the student was "listening." Fortunately for the e-teachers, not all of the students described their synchronous experience in such passive terms. JD even described in a later interview a more active participation: "If he [the teacher] says something important, I just flip back up to the screen and see what he is writing up and then write up what he's writing up or print [*sic*] it off." However, even in this context, the important materials get translated into a physical artifact (as opposed to the electronic environment offered by the virtual classroom).

In fact all of the students described an active participation during their synchronous classes. In her language arts class, Mya described one of her synchronous classes:

> I'd have Elluminate *Live!* up and the instruction, the instructor would be giving like the lesson that we would be reviewing that day. Normally, its just going over a part in a novel or something like that, and then we have to evaluate it and take roles in it. … We would type them all first, and then we would copy and paste them into the direct messaging.

These descriptions are consistent with the kinds of descriptions that might be expected in a traditional classroom: students taking notes based upon their science teacher's lecture; students reading a novel aloud in an English class and then answering questions on the passage they had just completed; fine arts students searching through provided resources to find examples of a particular artistic concept; or a mathematics teacher beginning the class by reviewing the formula and sample problems from the previous class.

One of the reasons that e-teachers and their students make effective use of their synchronous time may be these similarities to the traditional classroom environment. In his discussion of how innovations are diffused, Rogers (2003) described five perceived attributes that potential adopters base their opinions of an innovation on: relative advantage, compatibility, complexity, trialability, and observability. According to Surrey and Ely (2007), a person is more likely to use something new if it "offers them a better way to do something; is compatible with their values, beliefs and needs; is not too complex; can be tried out before adoption; and has observable benefits" (p. 106). The virtual classroom utilized by the CDLI allows teachers to teach in a way that is compatible with how they have taught in the traditional classroom environment.

One aspect of the virtual classroom that is different than a traditional classroom that e-teachers seem to have adopted was alluded to by Peter when he said, "He [the teacher] would like put multiple choices on the board, ah, up on the whiteboard and we'd have to select which answer." The use of the polling feature to ensure that students were paying attention was seen as "a better way to do" this in a virtual environment where the e-teacher was unable to see their students. This fact was not lost on the students either. Jasmine described this instructional strategy as follows: "My teacher usually gets us to say something or put up a checkmark to make sure we are paying attention."

Students were much more productive during their synchronous class time compared to their asynchronous class time, as Max indicated there was no actual teacher there to police the students and keep them on task. Even the use of the polling feature was not always effective, as was discovered during an observation of the students during a synchronous language arts class. From the beginning to the end of class, the three students talked about the school's graduation, the upcoming trip to Signal City, what had occurred the previous weekend, what they were going to do that coming weekend, their plans for summer break, the movie *The Breakfast Club*, school spirit, and so on. During these conversations, all three students were logged into Elluminate *Live!*, and one of the three students appeared to be responsible for paying closer attention, as she would periodically tell the other two to type something or click on something.

While this particular class was a rarity, at least based upon observations, the students' behavior is an illustration of the difficulties of the virtual environment for students who are being "compelled to assume a degree of autonomy they are not ready to handle" (Moore, 1973, p. 84). There were other examples of off-task behavior. For example, there was a greater amount of conversation between the students in the distance education room than a classroom teacher would be accustomed to seeing. This is not to suggest that the students were talking to each other on a continuous basis. On the contrary, based on observations of 22 synchronous classes, the amount of conversation between students was usually

limited to 10–15 minutes out of a 60-minute class and, as indicated in the table below, much of that conversation was focused on the content of the synchronous class.

Table 2 *Percentage of the conversation during synchronous classes about the subject area with fellow students in the local distance education room*

Student	Interview 1	Interview 2	Interview 3	Interview 4	*Mean*
Cassandra	50%	30%–40%	25%	20%–25%	*35%*
JD	50%	40%	75%–80%	40%–60%	*55%*
Peter	40%	80%	NA	50%	*55%*
Mya	75%	100%	100%	75%	*90%*
Jasmine	95%	100%	100%	100%	*100%*
Kathy	95%	90%	90%	50%	*80%*
Justine	NA	65%	25% (math) 50% (science)	10%	*40%*
Max	90%	50%	50%	80%	*70%*
Mean	*70%*	*70%*	*65%*	*50%*	***65%***

If you remove the two students who were enrolled in classes by themselves from the table above (as these students did not have fellow students to talk to in the local distance education room while they were engaged in this virtual schooling), the overall mean for conversation with other students in the room about the subject area drops to approximately 55%. So even though the synchronous time was the time when students were most on task, there were still times when they were engaged in other, distracting activities.

The students' decision about whether to pay attention or talk about other things during their synchronous class time was based upon a number of different factors. The difficulty or importance of the course or the particular topic the e-teacher was covering was mentioned by Max: "We'll talk every now and then, but if he's [the e-teacher] talking about something important, we'll pay attention." This behavior is consistent with the differences between adult and adolescent learners described by Knowles (1970). The CDLI students were not as self-directed as adult learners; had not accumulated a variety of personal strategies and resources for their learning; were still oriented to learning due to a requirement, as opposed to a specific goal-related desire; and still possessed an orientation toward learning that was focused upon the subject, as opposed to a particular problem.

Local Synchronous Learning Community

As described earlier in this section, the students spent between 10–15 minutes per class (or 15% to 25% of the class time) talking to one another, and approximately 65% of that conversation was about the content being presented in that class. Max described these conversations as follows:

> It might be something about what's going on in class, if you got, well, if we don't understand what, cause usually one of us understands what's going on, we'll just talk about that for a second…. Just like say where'd he get that answer to and whatever, and the other person say yeah.

Kathy and Justine both described these conversations in a much briefer fashion. Kathy said she would talk to other students "sometimes if I have to ask them a question about stuff." And Justine said, "If we don't understand something we ask each other."

It was not surprising that these students built a support community among themselves that they utilized during their synchronous classes. A stronger sense of community is normally present in rural schools (Kannapel & DeYoung, 1999), and students at Beaches used terms like "friendly," "close knit," and "family" to describe their rural school. However, the further decrease from their regular small class size at Beaches All Grade to an even smaller local virtual school class size increased the sense of community for these students.

These students all felt that the smaller class size in their virtual school classes created a greater sense of community with their local virtual school classmates. Conrad (2002) described place-based communities, or communities that were physically together, as "like-minded groups of people [gathered] together in the spirit of shared goals" (p. 4). In the case of CDLI, the shared goals focused on understanding the material that their e-teacher presented. Cross (1998) believed that a learning community was intended to foster "active learning over passive learning, cooperation over competition, and community over isolation" (p. 5). CDLI students were quite active in their learning and cooperated to ensure that everyone who expressed confusion understood the material; students frequently asked each other content-based questions during synchronous class time.

Interaction—Text Over Talk

As illustrated earlier, the two main methods that students had for interacting with their teacher and the other students in the virtual classroom were the microphone or direct messaging. While students did use both media, all but one student preferred to use direct messaging when given the choice. This behavior was consistent with Nippard (2005), who found that CDLI students in the six courses that he observed preferred to use direct messaging in their virtual classrooms. Most of the students who preferred direct messaging did so because they were shy about speaking over the microphone in general or because they felt that they didn't know the online classmates. "I just don't like talking over the mic," said Jasmine, and Justine indicated, "I guess I'm kind of shy using the mic." Mya was a little more practical about her discomfort with speaking out over the microphone: "I'm not comfortable with it personally…. I just find it quicker and easier, you get more people talking at once rather than one at a time."

This pattern is similar to events in a traditional classroom—some students don't mind speaking up, but just as many or more prefer to not speak. Another possible explanation, however, may lie in the sense of community that existed between the students at Beaches and their virtual school classmates. Unlike the tight local community that had developed, there was little sense of community within the virtual environment. "I don't even know most of them, don't know what they look like, only know their names," indicated Peter. This was fairly consistent with comments made by all but one of the eight students. Mya was the only student that relayed any sense of familiarity with her online classmates.

While the lack of familiarity with their online colleagues did decrease the amount of verbal interaction and increase the amount of written interaction that seven of the eight students had, it didn't decrease the overall amount of their interaction. The exception to this was Max, who stated, "I probably won't make certain comments because I don't know how certain people would react, so I just keep my

mouth shut." Given this quote, one might speculate that these comments would not necessarily be related to the class content and that Max's level of on-task interaction was not affected by the lack of familiarity with his virtual school classmates.

A sense of community or a connection between learners is affected by, among other things, the level of social presence felt by the learners (Gunawardena & Zittle, 1997; Rovai, 2001). Short, Williams, and Christie (1976) defined social presence as "the degree of awareness of another person in an interaction and the consequent appreciation of an interpersonal relationship" (p. 66), while Garrison and Anderson (2003) defined it as "the ability of learners to project themselves socially and emotionally into a community of inquiry through the mediums of communication being used" (p. 49). The students reported two e-teachers had students send in pictures and information about themselves, which the e-teacher used during a synchronous class to introduce the students to each other. However, the CDLI students at Beaches still did not feel that their online classmates projected themselves in any way that fostered any meaningful relationship.

The two variables that make up social presence are intimacy and immediacy (Short et al., 1976). Tu (2002) stated that intimacy included things such as "eye contact, physical proximity, and topic of conversation" (p. 133), while immediacy was "the psychology distance between a communicator and the recipient of the communication" (p. 134). The tools included in the virtual classroom, along with the students' use of emoticons and other linguistic features associated with text messaging, allowed the students to exhibit some level of intimacy; however, the CDLI students at Beaches felt a high degree of distance from their online classmates, which accounted for the perceptions of a low level of social presence and lack of community with their online classmates.

Conclusions and Implications

Rural schooling faces many challenges. Distance education programs, such as virtual schools, are often designed to provide rural students with courses that are difficult to offer due to low levels of student enrollment and lack of specialized teachers. The purpose of this study was to explore the implementation of one virtual school program in a Newfoundland and Labrador rural school, specifically their synchronous online instruction. The students' experiences in this synchronous environment were consistent with the experience that these students would have likely received in a more traditional face-to-face classroom. Further, a strong sense of community support developed among the local students enrolled in the virtual school program during their synchronous sessions. Finally, during their synchronous classes the students preferred to interact using chat as opposed to using the microphone and speaking to the group.

As an isolated case study, this study represents a limited attempt to address the lack of research into synchronous online teaching in the virtual school environment. While synchronous learning represents a small amount of the actual online instruction that occurs within virtual schools, there are several programs that utilize small-group and individualized synchronous instruction. As such, lessons learned in this environment may be useful to other virtual school programs—just in slightly different contexts and modes of usage. These lessons include the need for online teachers to be better trained to utilize the synchronous tools beyond what they have been conditioned to do in the face-to-face environment. Additionally, both online teachers and individual schools participating in virtual school programs need to find ways to foster students' support of each other during their synchronous classes. Finally, online teachers need to find ways to help foster an online sense of community within their synchronous sessions that might encourage students to be more active and, in particular, vocal in their participation.

All of that said, given that this study was a case study of a small number of students in a single rural school, further research is needed into promising practices for synchronous online instruction with K-12 learners. Given the lack of research into synchronous instruction in the virtual schooling environment overall, a call for additional research of any kind that focuses on synchronous instruction would be warranted. However, based on this specific case study, it would be interesting to explore whether these findings would still be relevant today. The data for this particular case was collected almost a decade ago, and advances in virtual classroom environments, video technology, and the availability of bandwidth might yield different results today. Finally, it would also be interesting to examine whether this additional time had any impact on the specific synchronous instructional practices of teachers using these tools (i.e., are e-teachers still replicating traditional classroom pedagogy), which might also impact both how the students experience their synchronous instruction and—in particular—the time on task during that instruction.

References

Barbour, M. K. (2007a). *What are they doing and how are they doing it? Rural student experiences in virtual schooling* (Unpublished doctoral dissertation). University of Georgia, Athens, GA.

Barbour, M. K. (2007b). Portrait of rural virtual schooling. *Canadian Journal of Educational Administration and Policy*, (59). Retrieved from http://www.umanitoba.ca/publications/cjeap/articles/barbour.html

Barbour, M. K. (2013). The landscape of K-12 online learning: Examining what is known. In M. G. Moore (Ed.), *Handbook of distance education* (3rd ed., pp. 574–593). New York: Routledge.

Barbour, M. K. (2014). A history of international K-12 online and blended instruction. In R. Ferdig & K. Kennedy (Eds.), *Handbook of research on K-12 online and blended learning* (pp. 25–50). Pittsburgh, PA: Entertainment Technology Center Press, Carnegie Mellon University. Retrieved from http://press.etc.cmu.edu/files/Handbook-Blended-Learning_Ferdig-Kennedy-etal_web.pdf

Barbour, M. K., & Adelstein, D. (2013). *Voracious appetite of online teaching: Examining labour issues related to K-12 online learning*. Vancouver, BC: British Columbia Teachers Federation. Retrieved from http://www.bctf.ca/uploadedFiles/Public/Issues/Technology/VoraciousAppetite.pdf

Barbour, M. K., & Bennett, C. (2013). The FarNet journey: Effective teaching strategies for engaging Māori students on the Virtual Learning Network. *Journal of Open, Flexible and Distance Learning, 17*(1), 12–23. Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/viewFile/195/156

Barbour, M. K., Brown, R., Hasler Waters, L., Hoey, R., Hunt, J., Kennedy, K., Ounsworth, C., Powell, A., & Trimm, T. (2011). *Online and blended learning: A survey of policy and practice from K-12 schools around the world*. Vienna, VA: International Association for K-12 Online Learning.

Barbour, M. K., Clark, T., DeBruler, K., & Bruno, J. A. (2014). *Evaluation and approval constructs for online and blended courses and providers*. Lansing, MI: Michigan Virtual Learning Research Institute at MVU. Retrieved from http://media.mivu.org/institute/pdf/eval_constructs.pdf

Barbour, M. K., Hasler Waters, L., & Hunt, J. (2011) *Online and blended learning: Case studies from K-12 schools around the world*. Vienna, VA: International Association for K-12 Online Learning.

Barbour, M. K., & Hill, J. R. (2011). What are they doing and how are they doing it? Rural student experiences in virtual schooling. *Journal of Distance Education, 25*(1). Retrieved from http://www.jofde.ca/index.php/jde/article/view/725

Bassey, M. (1999). *Case study research in educational settings*. Buckingham, England and Philadelphia: Open University Press.

Bennett, C., & Barbour, M. K. (2012). The FarNet journey: Perceptions of Māori students engaged in secondary online learning. *Journal of Open, Flexible & Distance Learning, 16*(1). Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/105

Conrad, D. (2002). Deep in the hearts of learners: Insights into the nature of online community. *Journal of Distance Education, 17*(1), 1–19.

Cosby, A. G., & McDermott, V. P. (1978). Rural youth in context. In A. G. Cosby & I. Charner (Eds.), *Education and work in rural America: The social context of early career decision and achievement* (pp. 1–18). College Station, TX: Texas A&M University.

Crocker, R. (1989). *Towards an achieving society*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.

Crocker, R., & Riggs, F. T. (1979). *Improving the quality of education: Challenge and opportunity*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.

Cross, K. P. (1998). Why learning communities? Why now? *About Campus, 3*(3), 4–11.

Davis, N. E., & Roblyer, M. D. (2005, October). *A collaborative project to prepare virtual teachers*. Paper presented at the Virtual High School Symposium, Denver, CO.

DiPietro, M. (2010). Virtual school pedagogy: The instructional practices of K-12 Virtual School Teachers. *Journal of Educational Computing Research, 42*(3), 327–354.

DiPietro, M., Ferdig, R. E., Black, E. W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning, 7*(1). Retrieved from http://www.ncolr.org/jiol/issues/pdf/7.1.2.pdf

Easton, S. (2003). Clarifying the instructor's role in online distance learning. *Communication Education, 52*(2), 87–105.

Ezzy, D. (2002). *Qualitative analysis: Practice and innovation*. London: Routledge.

Garrison, D. R., & Anderson, T. (2003). *E–Learning in the 21st century: A framework for research and practice*. London: Routledge/Falmer.

Government of Newfoundland and Labrador. (2005). *Education statistics: Elementary-secondary*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.

Greenway, R., & Vanourek, G. (2006). The virtual revolution: Understanding online schools. *Education Next,* (2). Retrieved from http://media.hoover.org/sites/default/files/documents/ednext20062_34.pdf

Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *American Journal of Distance Education, 11*(3), 8–26.

Harms, C. M., Niederhauser, D. S., Davis, N. E., Roblyer, M. D., & Gilbert, S. B. (2006). Educating educators for virtual schooling: Communicating roles and responsibilities. *The Electronic Journal of Communication, 16*(1-2). Retrieved from http://public.vrac.iastate.edu/~gilbert/papers/JP2007-harms-niederhauser.pdf

House, D. (1986). *Education for self-reliance: A report on education and training in Newfoundland*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.

International Association for K-12 Online Learning. (2011). *National standards for quality online teaching*. Vienna, VA: Authors. Retrieved from http://www.inacol.org/wp-content/uploads/2015/02/national-standards-for-quality-online-courses-v2.pdf

Kannapel, P. J., & DeYoung, A. J. (1999). The rural school problem in 1999: A review and critique of the literature. *Journal of Research in Rural Education, 15*(2), 67–79.

Knowles, M. S. (1970). *The modern practice of adult education: Andragogy vs. pedagogy*. New York, NY: Association Press.

Lai, K.-W., & Pratt, K. (2009). Technological constraints and implementation barriers of using videoconferencing for virtual teaching in New Zealand secondary schools. *Journal of Technology and Teacher Education, 17*(4), 505–522.

LeCompte, M. D., & Preissle, J. (1993). *Ethnography and qualitative design in educational research* (2nd ed.). San Diego: Academic Press.

Lowes, S. (2005). *Online teaching and classroom change: The impact of virtual high school on its teachers and their schools*. Naperville, IL: Learning Point Associates.

Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Jossey-Bass Publishers.

Moore, M. G. (1972). Learner autonomy: The second dimension of independent learning. *Convergence, Fall*, 76–88.

Moore, M. G. (1973). Toward a theory of independent learning and teaching. *Journal of Higher Education, 44*(12), 661–679.

Moore, M. G. (1983). The individual adult learner. In M. Tight (Ed.), *Education for adults: Volume 1 - Adult learning and education* (pp. 153–168). London, UK: Croom Helm Ltd.

Moore, M. G. (1993). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 22–38). London: Routledge.

Moore, M. G., & Kearsley, G. (1996). *Distance education: A systems view*. Belmont, CA: Wadsworth.

Morris, S. (2002). *Teaching and learning online: A step-by-step guide for designing an online K-12 school program*. Lanham, MD: Scarecrow Press Inc.

Murphy, E. (2009). Online synchronous communication in the second-language classroom. *Canadian Journal of Learning and Technology, 35*(3). Retrieved from http://www.cjlt.ca/index.php/cjlt/article/view/539

Murphy, E., & Coffin, G. (2003). Synchronous communication in a web-based senior high school course: Maximizing affordances and minimizing constraints of the tools. *American Journal of Distance Education, 17*(4), 235–246.

Murphy, E., & Rodríguez-Manzanares, M. (2008). Revisiting transactional distance theory in a context of web-based high-school distance education. *Journal of Distance Education, 22*(2), 1–14. Retrieved from http://www.ijede.ca/index.php/jde/article/view/38/550

Murphy, E., & Rodríguez-Manzanares, M. (2009a). Sage without a stage: A cultural historical activity theory perspective on E-teaching in web-based, high-school classrooms. *International Review of Research in Open and Distance Learning, 10*(3). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/579/1300

Murphy, E., & Rodríguez-Manzanares, M. (2009b). Learner-centredness in high-school distance learning: Teachers' perspectives and research-validated principles. *Australasian Journal of Educational Technology, 25*(5), 597–610. Retrieved from http://www.ascilite.org.au/ajet/ajet25/murphy.pdf

Murphy, E., & Rodríguez-Manzanares, M. (2012). Rapport in distance education. *International Review of Research in Open and Distance Learning, 13*(1), 167–190. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1057

Murphy, E., Rodríguez-Manzanares, M., & Barbour, M. (2011). Asynchronous and synchronous online teaching: Perspectives of Canadian high school distance education teachers. *British Journal of Educational Technology, 42*(4), 583–591.

Nippard, E. C. (2005). *Social presence in the web-based synchronous secondary classroom* (Unpublished thesis). Memorial University of Newfoundland, St. John's, NL.

Nippard, N., & Murphy, E. (2007). Social presence in the web-based synchronous secondary classroom. *Canadian Journal of Learning and Technology, 33*(1). Retrieved from http://www.cjlt.ca/index.php/cjlt/article/view/24/22

North American Council for Online Learning. (2007). *National standards for quality online teaching*. Vienna, VA: Authors.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Pullar, K., & Brennan, C. (2008). Personalising learning for secondary students working in a blended (distance/face to face/vocational) learning environment. *Computers in New Zealand Schools, 20*(2), 6–16

Rice, K. (2011). *Making the move to K-12 online teaching: Research-based strategies and practices*. Boston: Pearson.

Riggs, F. T. (1987). *Report of the Small Schools Study Project*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.

Roberts, R. (2009). Video conferencing in distance learning: A New Zealand schools' perspective. *Journal of Distance Learning, 13*(1), 91–107.

Roblyer, M. D., Freeman, J., Stabler, M., & Schniedmiller, J. (2007). *External evaluation of the Alabama ACCESS initiative phase 3 report*. Eugene, OR: International Society for Technology in Education.

Roblyer, M. D., & McKenzie, B. (2000). Distant but not out-of-touch: What makes an effective distance learning instructor? *Learning and Leading With Technology, 27*(6), 50–53.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press: New York, NY.

Rovai, A. P. (2001). Classroom community at a distance: A comparative analysis of two ALN-based university programs. *Internet and Higher Education, 4*(2), 105–118.

Ruona, W. E. A. (2005). Analyzing qualitative data. In R. A. Swanson & E. F. Holdton III (Eds.), *Research in organizations: Foundations and methods of inquiry* (pp. 233–263). San Francisco, CA: Berrett-Koehler Publishers, Inc.

Shank, G. D. (2002). *Qualitative research: A personal skills approach*. Upper Saddle River, NJ: Merrill Prentice Hall.

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. London, UK: John Wiley & Sons.

Smith, R. D. (2009). Virtual voices: Online teachers' perceptions of online teaching standards. *Journal of Technology and Teacher Education, 17*(4), 547–571.

Sparkes, R., & Williams, L. (2000). *Supporting learning: Ministerial panel on educational delivery in the classroom*. St. John's, NL: Queen's Printing for Newfoundland and Labrador.

Stake, R. (1995). *The art of case study research: Perspectives on practice*. Thousand Oaks, CA: Sage Publications.

Surrey, D. W., & Ely, D. P. (2007). Adoption, diffusion, implementation, and institutionalization of instructional innovations. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (2nd ed., pp. 104–122). Upper Saddle River, NJ: Pearson Education, Inc.

Tu, C. H. (2002). The measurement of social presence in an online learning environment. *International Journal on E-Learning, 1*(2), 34–45.

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Parent and Student Perceptions of Parent Engagement at a Cyber Charter High School

Jered Borup and Mark A. Stevens
George Mason University

Lisa Hasler Waters
Flint Hill School, VA

Abstract

As enrollments in cyber charter schools grow, it becomes increasingly important to understand how parents engage in their students' learning. Researchers have hypothesized that parental engagement is even more critical when online students learn from home, but few researchers have examined parents' engagement behavior—especially parents of adolescent learners. In this case study we addressed this gap using parent and student interviews at a full-time online charter school. Our analysis of 19 interviews with 9 parents and 10 interviews with 10 students identified five primary types of parental engagement within this setting: (1) nurturing relationships and interactions, (2) advising and mentoring, (3) organizing, (4) monitoring and motivating student engagement, and (5) instructing. We also identified obstacles to effective parental engagement, and in this paper we discuss how programs can work with parents to foster more collaborative relationships.

Introduction

K-12 online learning began over 20 years ago and has expanded rapidly during the last decade. The majority of enrollments are from high school students supplementing their face-to-face courses with one or two online courses. These types of supplemental courses are commonly provided by programs traditionally called virtual schools (Barbour, 2013). Students are also increasingly enrolling in cyber schools (International Association for K-12 Online Learning [iNACOL], 2012), or programs that allow students to take all or most of their courses online (Barbour, 2013). These growth trends have occurred

despite attrition rates that are higher than those found in traditional brick-and-mortar schools (Freidhoff, 2015; Miron & Gulosino, 2015; Watson, Murin, Vashaw, Gremin, & Rapp, 2013). Although the solution to narrowing this achievement gap is multifaceted and complex, some researchers have focused on the need to more fully engage parents in the learning process—especially in cyber schools where students spend all or most of their time studying at home (Borup, Graham, & Davies, 2013; Liu, Black, Algina, Cavanaugh, & Dawson, 2010). However, little research exists that has examined parental engagement in cyber schools, and the existing research has focused largely on parental engagement in online elementary school settings (Hasler Waters, Menchaca, & Borup, 2014).

The lack of research on parental engagement with older student populations is especially concerning because the majority of cyber school enrollments have occurred within high school populations (Watson et al., 2013). Although research with younger populations can be insightful, generalizations cannot be made to adolescent students due to differences in student characteristics and course content (McNeal, 2012). The limited research that has examined parental engagement in cyber high schools has also been based largely on parent (Curtis, 2013) and teacher (Borup, 2015) perceptions, and greater insights are likely when these perceptions are examined in conjunction with those of students. In this research we addressed this gap using interview data obtained from students *and* parents at a cyber high school.

Literature Review

Researchers have reported that parental engagement in K-12 online learning is critical to improving course outcomes (Boulton, 2008; Litke, 1998). Klein (2006) also reported that parents found it rewarding to work closely with their students, especially when they witnessed their children making connections between the course content and their daily life. Liu et al. (2010) suggest that parents who support their students in online courses could help students develop perseverance and an internal locus of control, as well as organizational and time management skills. However, research is lacking that helps to better understand the types and amounts of parental involvement necessary to help students succeed in these unique environments. In this section of the article, we will first review the research examining the levels of parental engagement in online environments and the overall impact that their engagement has on learning outcomes. Following that review, we will discuss the frameworks that have been created in an attempt to categorize the various types of parental engagement in online learning environments.

Levels and Impact of Parental Engagement

Researchers have found that levels of parental involvement in online learning vary across students. For instance, 79 parent survey respondents reported spending nearly 1.5 hours per week interacting with their students regarding their learning in a freshman English course at a cyber high school (Borup, Graham, & Davies, 2013). Parent responses varied greatly, resulting in a standard deviation (74.3) close to the mean (86.0). Litke (1998) was the first to document this phenomenon qualitatively. Following the analysis of teacher, student, and parent interviews at a small program that allowed students to take most of the coursework online, Litke identified three types of parents:

1. Absentee parents who provided students with little support or supervision due to demands outside of the home.
2. Supportive parents who increased their engagement following student difficulties.
3. Participatory parents who worked closely with students throughout the course.

Similarly, Hasler Waters et al.'s (2014) review of the literature found that parents of online students traversed along a continuum of engagement—from no engagement to full engagement—based on student needs, school policies, and availability. Because needs vary across students, it is not surprising that the level of parental engagement also varies. However, problems arise when parents' misconceptions about

students' needs or other factors prevent them from providing the needed level of support that students require. For instance, Litke (1998) in part blamed poor course outcomes on parents who underestimated student needs and failed to provide them with adequate support. More recently, parents in Borup et al.'s (2013) research rated their motivational impact on student learning at a cyber high school significantly lower than the impact that their students reported. Parents' underestimating their potential impact helps to explain Boulton's (2008) case study of British high school students enrolled in a two-year online certificate program. Boulton found that parents initially supported students, but their support quickly declined and was a contributing factor in some students' failure in the program. Boulton hypothesized that sustained teacher–parent communication could have helped parents to better understand and fulfill their responsibilities. Although the number of schools that have explicit policies for teacher–parent communication is growing, many schools do not have such requirements, and those that do exist tend be reactionary, requiring parents to communicate with teachers after their student has performed poorly (Cavanaugh et al., 2009).

Although important, communication from teachers is unlikely to overcome all of the obstacles to parental engagement. For instance, Russell (2004) reported that virtual-school parents who were economically disadvantaged and required to work long hours outside of the home could not provide important student supervision at home, placing their students at a disadvantage. Additionally, parents' perceptions of their responsibilities and their self-efficacy in their abilities to impact student learning can determine the types and levels of support that parents provide. As a result, it is important that researchers work to better understand parent perceptions and experiences.

Only two studies have quantitatively examined the relationship between levels of parental engagement and online student performance. First, Black (2009) conducted a regression analysis and found no significant relationship between parents' (n = 452) reported levels of engagement and students' academic achievement in their virtual school courses. However, Black conducted a second regression analysis that included only the survey responses from the parents (n = 164) whose child also completed an accompanying student survey. This analysis found a positive relationship between parents' reported level of student praise and their child's academic achievement but a negative relationship between parents' reported levels of instruction and their child's academic achievement. Similarly, Borup et al. (2013) identified negative correlations between parents' reported levels of interaction with their cyber school student and student learning outcomes. However, these researchers warned against interpreting the negative relationships too simply by concluding that parents do not have a significant impact on student learning. Borup et al. (2013) explained, "If a large portion of parental interaction occurred in reaction to poor student performance, the correlation that results from examining a large group of students could mask the true benefit of parental involvement on individual student learning" (p. 52). Also, Borup et al. measured only the total time that parents spent interacting with students, not the intended purposes of those interactions. It is possible that more refined instruments would help to identify how particular types of parent engagement are correlated to certain learning outcomes with students who have specific learning characteristics. However, the initial obstacle to this type of research is that researchers have yet to identify and clearly define the different types of parental engagement in a cyber school setting.

Types of Parental Engagement

Graham, Henrie, and Gibbons (2014) explained that frameworks "by their very nature attempt to establish a common language and focus for the activities that take place in a scholarly community" (p. 13). These researchers also made the distinction between *explore frameworks*, which attempt to define and categorize variables within a phenomenon, and *explain frameworks*, which seek to identify relationships between variables and establish causal relationships. Parental engagement in cyber schools is a relatively new phenomenon and, as expected, researchers have struggled to establish widely accepted frameworks. In this section we will review initial attempts to identify types of parental engagement within online learning environments.

Guided by Hoover-Dempsey and Sandler's (1995, 2005) framework established in face-to-face settings, Hasler Waters (2012) conducted an in-depth case study examining how five parents engaged in their students' learning at a cyber elementary school. The school required parents to assume a high level of responsibility and act as *learning coach*. Learning coaches are commonly used by cyber schools and typically assume many of the administrative and supervisory roles that are typically performed by teachers in a face-to-face environment (Hasler Waters, Barbour, & Menchaca, 2014). Shoaf (2007) also explained that learning coaches of young students might grade and compile students' work for the online instructor to review. Hasler Waters found that parents acting as learning coaches engaged in encouraging, reinforcing, modeling, and instructing activities similar to those described by Hoover-Dempsey and Sandler (1995, 2005). However, she identified two additional types of parental engagement. First, parents engaged in adapting strategies that helped tailor instructional strategies, environments, schedules, and their own belief systems to better meet student needs. Second, parents leveraged support and materials from a variety of locations in ways that benefited students' learning.

Although Hasler Waters' (2012) framework can be insightful to those attempting to understand parental engagement in cyber high school settings, it should not be generalized. Research conducted in face-to-face settings has found that parental engagement tends to decline as students age, and the effective types of parental engagement in high school settings can differ from those effective in younger grades (Noel, Stark, Redford, & Zuckerberg, 2015). McNeal (2012) added, "What is an appropriate and effective form of parent involvement for younger children may not be effective for children in later adolescence" (p. 88). The same phenomenon is also likely in cyber school settings. This may help to explain why Hasler Waters' classification of parental engagement has differed from those applied in cyber high schools.

Curtis' (2013) dissertation research was the first to identify types of parental engagement at a cyber high school. Curtis conducted 16 interviews with eight parents and categorized parents' primary engagement responsibilities into three categories: monitoring, mentoring, and motivating. Similar to Hasler Waters (2012), Curtis defined motivating as actions that encourage and reinforce student engagement. Monitoring included tasks such as establishing learning schedules, organizing learning materials, and tracking student behavior and performance. Lastly, mentoring consisted of parents demonstrating their love and care for students and guiding them through learning activities.

More recently, Borup, West, Graham, and Davies (2014) used existing online learning research to create the Adolescent Community of Engagement (ACE) framework. The framework was designed to provide a more comprehensive understanding of student support systems by explaining how parents, teachers, and student peers could work in conjunction to improve adolescent student engagement in online learning settings. The ACE framework (see Figure 1) also moved past simply exploring the different types of engagement by establishing "researchable hypotheses on how those types of engagement may improve students' success" (p. 108). As a result, the ACE framework was selected for this research.

The ACE framework hypothesizes that parents have the following overlapping responsibilities:

- *organizing* students' environment and time,
- *instructing* students not only in the course content but in how to learn it effectively, and
- *facilitating student interactions* with the content and others in the course. This third responsibility was made up of three subelements:
    - *nurturing* caring relationships and fulfilling students' basic needs,
    - *volunteering* at school activities, and
    - *monitoring and motivating* student engagement.

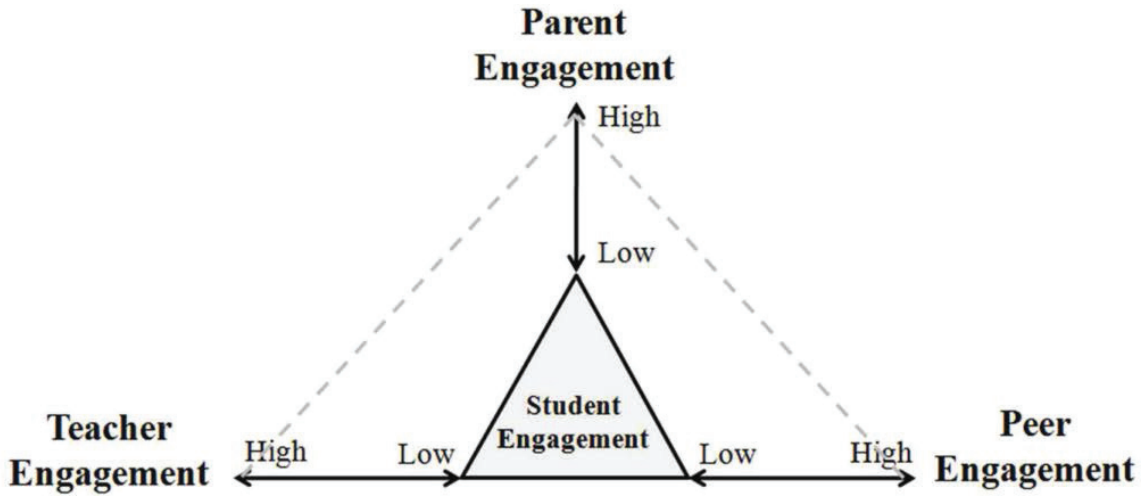


Figure 1. This figure represents the ACE framework. The surface area of the center triangle represents the level of student engagement. The ACE framework's primary hypothesis is that the level of student engagement will increase in conjunction with the levels of teacher, parent, and peer engagement.

The authors claimed that parents and teachers could perform these responsibilities separately but that greater educational outcomes would result if their efforts were coordinated. It should also be noted that the ACE framework was not designed specifically to explain parental engagement within cyber schools, and the authors stated, "Differing learner models will also place varying emphasis on parent engagement. In full-time online programs [cyber schools] students work from home, increasing the need for parental monitoring, organizing, and instructing in comparison to what is required in supplemental programs" (Borup et al., 2014, p. 23).

Borup (2015) used the ACE framework to examine teacher perceptions of parental engagement at a cyber charter high school and found the framework largely consistent with teachers' perceptions. However, Borup also identified *encouraging communication* to be an important element of parent engagement because teachers commonly reported that parents fostered learner–instructor interactions. Additionally, while volunteering was an important way parents fostered student engagement, it appeared to be a subcategory of motivating rather than its own element, as originally explained in the ACE framework. Teachers also expressed some frustrations when working with parents who failed to respond to their communication or who overstepped their responsibilities. For instance, some teachers believed that a small number of parents were doing students' work rather than scaffolding them throughout the learning process. One of the primary limitations of this research was that it relied solely on teacher perceptions. This research was also guided by the ACE framework, but we focused on interview data obtained from both parents and their students.

Methods

We used a descriptive qualitative case study methodology for this research. Stake (2010) explained that qualitative research is best when the purpose of the research is "understanding one thing well" (p. 27). Merriam (1998) also recommended that researchers "see the case as a thing, a single entity, a unit around which there are boundaries" (p. 27). For this case study, we placed boundaries around parent engagement in a cyber high school. Following Wolcott's (1994) recommendation, we resisted the "tendency to increase the scale, rather than the depth" (p. 181). As a result, we examined parental engagement at only a single online charter high school, with the understanding that this approach

prevented us from making comparisons across settings. However, we also had embedded units within our case study so that we could identify themes across multiple parents at the school (Baxter & Jack, 2008).

Context

We selected Mountain Heights Academy (MHA), a cyber charter high school in Utah, as the site for this case study. At the time data was collected, MHA employed 21 teachers and enrolled 338 students in Grades 9–12. The average course pass rate across all courses was 76%, and of all grades earned, 40% were an "A." As a school, MHA outperformed the state average in English, science, and math on the criterion-referenced test required by the state. MHA estimated that 18% of its student body was previously homeschooled, 14% was economically disadvantaged, 11% was enrolled in special education, and 90% was white.

MHA's belief statement, published on its website (http://mountainheightsacademy.org), stated that "students, parents, and teachers are all part of the educational team" (MHA, 2015, para. 2). MHA attempted to foster collaborative relationships with parents at a mandatory face-to-face orientation with teachers and administrators and via a parent organization that parents automatically joined at registration. MHA also held nonmandatory face-to-face activities throughout the year and invited parents to participate with their students.

Data Collection

Participant sampling was based on teacher recommendations. MHA assigned each student to a teacher who acted as a "shepherd." Shepherds regularly communicated with students and their parents to provide general support and act as an anchor adult whom they could contact for assistance. As a result, teachers tended to form close relationships with the students whom they shepherded. We asked five shepherds to use this understanding to help us sample two of their students for interviews for a total of 10 students. Using purposeful sampling, we asked each teacher to consider the average MHA student and provide a name of a student who was more highly engaged and a name of a student who was less engaged than the average student but also responsive to provided support and encouragement.

We invited each sampled student to participate in an hour-long interview. If a student declined, we obtained another teacher recommendation until we successfully sampled 10 students. Of the student participants, six were female and four were male. Students were also sampled across all grades: one freshman, three sophomores, two juniors, and four seniors. In addition, we conducted two interviews with each student's parent who was the most engaged in the student's learning. In all cases the parent was the mother. In one case siblings were sampled based on separate teacher recommendations. As a result we interviewed the siblings' mother three times instead of two. Of the nine mothers, eight did not work outside the home.

Data Analysis

The analysis was guided by elements of constant comparison coding methods as described by Glaser (1965). Parent and student statements were coded into as many different categories as possible while also following what Glaser referred to as the "defining rule for the constant comparative method" (p. 439)—comparing each statement or incident to all previous coded incidents. Codes were grouped based on similarities. This grouping was guided by the ACE framework. However, we were sensitive to themes that were not previously identified within the framework. One researcher took the lead analyzing the student interviews, and another researcher took the lead coding the parent interviews.

Measures were also taken to improve the trustworthiness of our analysis. Prior to analysis we conducted member checks by sending interview transcriptions to participants, who then checked them for

accuracy. Another member of the research team regularly reviewed all of the coding following the coding of every two to three interviews, and any disagreements in the coding were discussed and resolved.

Findings

Analysis of student and parent interviews resulted in the identification of five primary types of parental engagement. Each type of engagement is discussed in this section of the article.

Nurturing Relationships and Interactions

A major theme identified in the analysis was that parents' ability to facilitate communication and nurture close and trusting relationships with their students formed the foundation for all other types of parental engagement (see Table 1). Ashley summarized that before she and her spouse could impact their son's learning he needed to trust them, and their son Eric explained that he trusted his parents because they had responded to his learning needs in the past. As a result, there appeared to be a reciprocal relationship between trusting relationships and parents' impact on their students' learning, because a trusting relationship was both an outcome and a catalyst for parental engagement.

One parent emphasized the need for parents to proactively nurture loving relationships with their students: "There are lots of things that your children can learn in the outside world, but they can only really learn that you love them from you." Parents appeared to nurture loving relationships by listening to their students, understanding their academic and personal needs, and responding in ways that met those needs. Leslie believed that when she responded to her students' academic needs her students told themselves, "Hey, Mom loves me. I know she does because she makes sure that I'm getting my school done." However, five parents reported that engaging in their students' learning caused conflict. The level of conflict ranged from mild irritation to verbal altercations and open defiance. On one end of the spectrum, Alice found that her daughter would get irritated if Alice attempted to "micro-manage her." Laura was on the other end of the spectrum and reported that her son became extremely angry at seemingly benign actions. She explained that if she checked how much time her son spent in his courses he would become angry and say, "How dare you? How dare you check on me?" Similarly, Laura stated that if she reminded her son of upcoming due dates he would say, "It's none of your business, I'll get it in! Why are you bugging me?" Perhaps not surprisingly, Laura expressed discouragement and stated that she no longer wanted to do "battle" with her son.

Parents and students also recognized the importance of nurturing student–teacher relationships and interactions. Alice explained that teachers and parents "are both interested in the same outcome…. We both have to provide the support that we can." Samantha also acknowledged differences in the ways her parents and teachers engaged in her learning:

> It made me really confident and secure knowing that, even though my teachers were there and willing to help, that my parents were there if I needed a different kind of support. It really made me feel that I could do anything and accomplish anything I wanted because of that support system they provided.

However, some students were "shy about talking directly with teachers and getting help," and parents had to help nurture student–teacher relationships and interactions. For instance, Leslie would tell her son, "Dude, you've got to go to the teachers…. Your teacher's your best resource." Ellie, who was in her second year at MHA, provided a student's perspective when she said,

> I didn't really know how to ask for help from my teachers so I did turn to my parents a lot. … My parents were pushing me to go and ask my teacher … I hate being pushed… Eventually I just emailed [my teacher] and asked for help and she was really polite and responded.

Table 1 *Coding Results for Nurturing Relationships and Interactions*

Indicators	Parents (*n*)	Students (*n*)	Examples
Nurturing parent–teacher communication	9	5	"I know they get a lot of criticism, so I've tried to say [to the teachers], 'You know, I think it's great that you did this assignment'" (parent)
			"My mom would start quite a bit of conversations with [teachers] whenever she had questions." (student)
Providing for students' basic academic needs	8	3	"Just yesterday she asked me for some small candies or pennies for a lab she was doing." (parent)
			"Most of the time I'll have the stuff to do an assignment." (student)
Nurturing close student relationships	6	7	"Having that nurturing environment is crucial to any success, no matter what you're doing." (parent)
			"I think that your relationship with your parent actually affects your grades." (student)
Nurturing student–parent communication	6	7	"[S]he definitely seems happier at school when I take the time just to connect with her every day." (parent)
			"[My parents] would come to us and say, 'Do you need help? Are you struggling with something?'" (student)
Nurturing student–student communication	4	3	"I know that if that [social] element isn't there, then the education also suffers." (parent)
			"The first year, when I wasn't so social, they would help with that and encourage me to go on field trips." (student)

Parents also had to help their students correctly interpret teacher communications. Sylvia remembered that her daughter became frustrated after misinterpreting a teacher e-mail, and Sylvia had to ask her daughter, "Well, what's really happening here?"

Lastly, parents recognized the importance of collaborative relationships with teachers. One parent stated that teacher communication sent to her let her know "the teacher is paying attention to how [the students] are doing." Parents who initiated contact with teachers were also generally happy at how quickly they received a response. Leslie explained, "I get responses right back. They don't delay at all."

Leslie summarized, "It's amazing the support that they give." Although most parent–teacher communication was positive, some parents shared that there were negative communications. Laura, a parent of an underperforming student, expressed some frustration that teachers did not contact her more frequently using mediums other than e-mail. However, Laura also accepted some of the blame because she "could have done a little more" to initiate contact with teachers. Ruth took exception when a teacher reprimanded her student for requesting an extension on an assignment due date. Inversely, Ashley became frustrated when a teacher did not hold her son to a higher standard. Another parent found collaborating with teachers difficult because she perceived that the teachers wanted to keep her at "arm's length," taking the attitude that, "We'd like you involved if you do what we tell you to do, but we don't want too much." Janice also expressed frustration with a teacher but admitted that establishing a relationship with the teacher may have helped, "I don't know her, never met her, but that could have been helpful."

Advising and Mentoring

Parents engaged in advising and mentoring activities when they assisted students on issues that extended beyond students' current course load (see Table 2). Parents explained that adolescents begin to make decisions "they have to live with" but "don't always see the end from the beginning." As a result, parents advised their students in an attempt to ensure that they made wise decisions that would positively impact their future. One of these long-lasting decisions was to enroll in MHA. As legal guardians, parents could have unilaterally enrolled their students at MHA, but parents understood that students would not "give it all their effort" if they were not part of the decision-making process.

Table 2 *Coding Results for Advising and Mentoring*

Indicators	Parents (*n*)	Students (*n*)	Examples
Assisting with enrollment	9	4	"I was intrigued [with MHA] and it looked like something that could work for us." (parent) "[My mom] put my name in the lottery to get me into the school." (student)
Encouraging students to set long-term goals	3	5	"We've encouraged both boys to take certain classes because of their college preparatory value." (parent) "[My parents] want me to learn as much as I can and be able to…grow up and become the best person that I can." (student)

Parents also advised students on setting goals after MHA, typically to attend college, so that they would "have better opportunities in life." In order to help prepare their students to get accepted into college, some parents encouraged their students to participate in extracurricular activities. For instance, Ashley explained, "Throughout high school we've talked about what kind of things look good on a college application. So we've encouraged him to do service, we've encouraged him to do his Eagle Scout—all those things we knew would help." Furthermore, Ashley advised her son on specific courses to take that would prepare him for college and qualify him for a scholarship. Leslie added that she "was always very involved with her [daughter's] counselors" to ensure that she was providing her daughter

with sound advising that would help her to reach her goal to attend cosmetology school. Lastly, Christine, who had previously homeschooled her students, enrolled her son into MHA because when it came time for him to apply to colleges he would "need a diploma, something credible, something to say he really did it."

Organizing

Transitioning to online learning required students who were previously homeschooled or attended a brick-and-mortar school to change how they learned, and parents assisted students in making this transition by helping them organize their space and time (see Table 3). For instance, Edith stated that students needed "a place where they know where they go [to learn]" or they would be "going all over the house." In fact, Janice found that she had to establish several different work spaces so her daughter could choose the one that she preferred. Providing a working environment that was free from distractions was especially difficult when multiple students were home. Ashley shared, "They get distracted from everything. I have a four year old screaming right now. There's a lot of distraction in this house." Edith explained that it was difficult to provide an organized learning environment because she was not organized herself.

Table 3 *Coding Results for Organizing*

Indicators	Parents (*n*)	Students (*n*)	Examples
Organizing time	9	9	"I do try to help her decide what subjects she wants to do and in what order." (parent) "My parents helped me to organize my time and the amount of assignments they wanted me to do a day." (student)
Organizing space	9	6	"We made a designated spot for each child to work. … Where there would be as few distractions as possible." (parent) "[My parents] always tried to make sure that it was quiet in there so that we could concentrate." (student)

Parents also found that they had to help students organize their time. One way parents would do this was by helping students create a learning schedule at the beginning of the year. This type of support then declined as students became more comfortable with learning online. However, the level of support varied throughout the year based on student characteristics. Anne, who had four students enrolled in MHA at different times, explained, "Each child is an individual, and I am finding with each of the four kids that I have to help some more than others."

Parents commonly supported their students by setting general expectations for the amount of time students should work each day and then creating daily or weekly learning schedules that prioritized specific learning activities. However, parents found that establishing detailed learning schedules was problematic because it was difficult to estimate the amount of time it would take students to complete assignments. Similarly, Sylvia explained that it was good for her to provide her daughter with scheduling "ideas and suggestions, but we're kind of all different and she doesn't operate the same as me."

Furthermore, some students rejected the schedules their parents provided. For instance, Eric admitted, "[My mom] usually makes a list for me that I don't really follow." As a result, parents commonly established general expectations and then provided students with flexibility on the course activities they worked on throughout the day. For instance, Alice established a "five-hour rule" that required her daughter to work "at least five hours every day for a 25-hour week" but allowed her to "decide what subjects she wants to do and in what order." This resulted in a somewhat inconsistent learning schedule for some students. For instance, Alice explained, "Some days [my daughter] will work on one subject almost all day for one day and then just do the others throughout the week. But other weeks she just does a little bit more evenly every day." Sylvia also provided her daughter with opportunities to plan her learning schedule but still maintained final approval over the schedules that she created.

It was possible for students to lose the freedom to set their own learning schedule if it negatively impacted their academic performance. Some parents also intervened when students spent so much time on their schoolwork that it negatively impacted other aspects of their lives. Samantha remembered that her parents had to "get involved a few times when it was 1 a.m. and [she] was still on the computer doing homework."

Sometimes parents proved ineffective at encouraging their students to maintain an adequate learning schedule. In the most extreme example, Laura explained that at times her son refused to do schoolwork and would leave the home without permission because she "physically can't restrain [him]." Some students also reported that occasionally parents actually distracted them from following a consistent learning schedule. For instance, Eric explained that at times he would be working on an assignment, and his mother would ask him to stop to help with his six brothers. Similarly, Amy stated that her parents would commonly interrupt her studies to have her help on the family farm:

> Sometimes it would have been in the middle of a quiz or an essay where I would have my "[thinking] cap" on, but I would lose that when I went to help and have to come back and be a little lost. I got really frustrated.

Although Amy talked to her parents about this issue, it continued to happen and she "had to get along with it." Ellie also found that at times when she was working her mother would take her away from her schoolwork to go with her on errands or to "to go get ice cream." Eric added that his mother's personal computer was not working, so they were "switching back and forth" on the computer that MHA provided Eric specifically for his education.

Monitoring and Motivating

Once students were enrolled in MHA and had an organized learning space and schedule, parents monitored and motivated students' behavior and performance (see Table 4). Although the level of monitoring and motivating that students needed could vary based on student characteristics, Anne explained that "even the independent [students] … need to feel that support from their parents." Parents commonly asked their students about their behavior and monitored their grades in the learning management system (LMS) or in weekly progress reports sent by teachers. Students also typically worked in locations where their parents could observe their behavior. This appeared helpful in keeping students on task. Eric explained, "It helps me keep on track, knowing that my mom is always in the kitchen." Parents' familiarity with students' personality and tendencies also helped them to monitor students' online behavior. For instance, Angie explained that her father would know that she was not doing schoolwork, because she would get a "little half-smile [on her face]."

Table 4 *Coding Results for Monitoring and Motivating*

Indicators	Parents (*n*)	Students (*n*)	Examples
Monitoring behavior	9	9	"I am fairly aware [of their behavior] because I walk in and out of the kitchen but they can find all kinds of ways to get around that." (parent)
			"If [my parents] catch me messing around watching YouTube videos and stuff, they will be like, 'Why aren't you doing school?'" (student)
Monitoring performance	9	9	"I used to look at his grades and assignments every day or every other day or I'd ask him, 'What do you have left in English?'" (parent)
			"My mom looks at my grades to make sure everything is okay." (student)
Modeling and volunteering	8	8	"When parents are involved…students see that it's important to the parents and so it's more important to them." (parent)
			"My dad works anywhere from 12 to 14 hours days. … It motivates me to get up in the morning to do my stuff." (student)
Encouraging engagement	7	9	"Sometimes if I see that she's lagging, I'll go over and make a little joke, 'Are you not getting enough attention?'" (parent)
			"[My mom] gives me moral support at times when I feel like school is crap and I don't want to take it anymore." (student)
Incentivizing engagement or performance	7	9	"As long as you can keep a B grade average, you don't have to pay your car insurance." (parent)
			"[My mom] will say, 'Why don't you go do this much math or science or whatever and then we can go do something fun.'" (student)
Establishing high expectations	7	4	"They know…if you have a college degree, you have better opportunities in life." (parent)
			"If I don't get straight 'A's I'm going to disappoint my parents." (student)
Praising performance and effort	6	5	"I am praising her for her hard work, it helps her." (parent)
			"[My mom] will say 'Oh, you got a 93 [percent] in Chemistry. Good job!'" (student)

Even when parents closely monitored their students at home, it could be difficult to know what students were actually doing on their computers, and some parents found it helpful to check students' analytic data within the LMS. Edith explained that by using this data "[she] knew how long [her student] was on the computer for what class so [she knew] if she's working or actually doing something else, [such as] chatting with other friends." Laura added that while she could use her parent login to "see how many hours and minutes were spent in each subject each day," it could be difficult to interpret the data because "it's a pretty long report," and it was sometimes unclear if students were actually doing "school things" when they were logged into the computer. Ashley found it more beneficial to review her son's browser history and discovered that he was chatting excessively with friends and Googling test questions. In one instance, she had her son e-mail the teacher and say, "I deserve a zero on this because I cheated." Despite some difficulty in monitoring students' online behavior, students' knowledge that parents could verify their online activity helped them to stay on task. Amber remembered being told at orientation that her teachers and parents would be able to monitor students' online behavior, and she believed that this awareness of being monitored "helped [her] a lot" to stay on task. Samantha also found that it "kept [her] focused" and that she "would have been less careful about things" if that data had not been made available to her parents.

Parental monitoring appeared to decrease once students showed the ability to stay on task and be successful online. For instance, Eric remembered that when he started at MHA his mother was a strict disciplinarian, but at the time of the interview she had taken "a much more passive role." One student, Samantha, recommended that parents take a balanced approach to monitoring student learning while also helping their students become more independent: "They should be there and be supportive and know what's going on, but at the same time give their kids their own space."

In addition to monitoring student behavior and performance, students explained that there were several things that parents did to motivate them to engage in learning activities. First, parents set high expectations for academic performance and communicated to students the importance of getting an education. Ellie stated, "[My parents] encourage me a lot to get good grades and try to be the best that I can be as far as school goes." These expectations were regularly communicated to students by parents' reactions to their academic performance. For instance, Angie recalled getting 91% on an assignment and her mother asking her, "Well, that's good but do you think you could redo it, maybe get it higher?" Kurt added that parents are especially good at setting expectations because they have an intimate knowledge of what students "can and can't handle."

Students also recognized their parents' high expectations when parents modeled to students the importance of education by maintaining academic interests/hobbies. Janice summarized that she tried to motivate her students by modeling that "learning is a great thing" and that "it was just part of [their] lives." Parents also modeled the importance of education by volunteering at school functions. However, volunteering appeared to be difficult for many parents due to other demands on their time. Anne stated, "I realize that there are a few opportunities where I could have [volunteered], but we have eight kids, and so I tend to volunteer my time in other areas, if you know what I mean." Similarly, Amy found that even though her mother wanted to attend school functions with her, she was too busy to actually do so. However, Amy added that "it was the thought that counted," and knowing that "[her mother] made the effort" had an effect on Amy similar to the effect her mother would have had if she had actually volunteered.

Parental praise and encouragement also appeared to be effective at motivating students. Christine found that parental praise was especially beneficial in courses that were difficult: "It's helpful to me to have [my mom] be like, 'Oh, good job!' because she knows how hard chemistry is for me." Angie also found that encouragement from her father helped her to finish assignments when she was feeling "worn out." Similarly, Hollie stated that she "would get into these moods" where she would want to give up on

projects, but encouragement from her mom helped her to persist to completion. Her mother, Leslie, confirmed that she "nudged [Hollie] a lot" so that she could meet her goals.

Parents also used rewards and punishments to incentivize student performance or engagement. Kurt remembered working harder after he was verbally reprimanded for his low performance and was told, "Look, if you don't do what you're supposed to do, there're going to be consequences." Parents and students stated that consequences typically were the removal of privileges, such as playing video games, watching television, or borrowing the family car. Parents also incentivized student performance with various rewards, including ice cream, candy, eating out, money, pool trips, sleepovers, parties, concert tickets, and electronics. Samantha explained that her mother created a token economy where she and her siblings would earn tokens that could be exchanged for money when they reached certain benchmarks. However, Samantha's mother, Anne, found that when Samantha became "old enough," she no longer required tokens to engage in learning activities and became a "self-motivated person." Similarly, Alice found that she did not have to incentivize her daughter to engage in learning activities, because she would reward herself by going outside or taking a break to read a book after she finished an assignment. Angie was actually happy that her parents did not incentivize her performance, because it "lessens the meaning of the project," and she "would only have done it just to get a prize." On the other end of the spectrum, Laura found that she was unable to motivate her son despite regular attempts. Ivan confirmed that it was "annoying" that his mother checked his grades daily and encouraged him to improve, but he admitted that "it helps a lot." Hollie explained that parents needed to find the right balance when attempting to motivate their students and that when "you have a good relationship [parents] know when to lay off, and they know when it's okay to push you to do better."

Instructing

Typically, when students had content-related questions, they "just asked [their] teachers because that's what they are there for." However, students turned to parents for tutoring or direct instruction of the course content, if their teachers were not immediately available (see Table 5). Ashley stated, "We were there when she needed help with certain assignments. We were just always here for her." Regardless of the reason, most students said that their parents tutored them on the course content at some point. Parents provided assistance in two ways. First, if parents did not already understand the content, they would learn it together with the student. Ruth provided an example of this more collaborative approach: "We will help him a lot in English, and we are reading together. I haven't read *How to Kill a Mockingbird*, so we are reading that out loud together." Ruth recalled an instance when her son was struggling with a social studies project and "was not understanding any of it." As a result, she thought to herself, "Let's work on this together." Another parent also engaged in shared learning activities by brainstorming a "research paper topic."

Second, when parents already understood the course content, they would provide their students with direct instruction. As a result, parents' ability to help their students was dependent on their understanding of the content, and in general parents were less able to assist their students in their math and science courses than in electives, language arts, and social studies. For instance, Leslie recalled that her son regularly asked her for help in math until she finally told him, "I don't have any clue what you're trying to do. … Contact your teacher." Hollie learned that she could turn to her father for help in English and her mother for help in math. In the social sciences and language arts, parents found that they could provide more assistance by reviewing or proofreading student work before it was submitted. Parents also used their previous knowledge to instruct their students on learning strategies, such as note-taking. It was less common for parents to help students with technology, but it did occur in some cases.

Table 5 *Coding Results for Instructing*

Indicators	Parents (*n*)	Students (*n*)	Examples
Instructing on the content	6	8	"She depended on [her dad] to help her with Math." (parent) "[My dad] is able to help me with some of the [English] concepts I struggle with." (student)
Instructing on learning skills	6	6	"I had to teach him how to take notes." (parent) "[My parents] always say to have a pen and paper by you to take notes to help study for quizzes and tests." (student)
Instructing on technology	2	3	"Actually this happened about twice, our internet goes down and she'll come and tell me about that." (parent) "When it is technology problems, at least on the computer, I usually turn to my teachers, but if it is like something that has to do with my iPod or my Kindle or my camera or something I'll usually go ask my dad." (student)

Although most students were appreciative of their parents' assistance, Ivan became frustrated when his mom would take him "though the steps" and wanted her to "just stop talking and give [him] the answer." Leslie shared one strategy that her son would use to get her to give him the answer: "He'll sit and just act like he has no clue…until you finally get so frustrated and irritated with him that you give him the answer." As a result, Leslie recalled finally saying to her son, "We're here to help. We're not here to do it for you." However, in one case, a student admitted that his parent went beyond providing assistance to actually doing the work for him. Matt explained that on some assignments, such as discussion board activities that he viewed as "pointless," his mother would "do it on her computer while [he was] doing something with more urgency."

Discussion

Litke (1998) grouped the types of support parents provide to students into one of three categories: absentee, supportive, or participatory. However, the data collected from this study indicated that parental engagement was more fluid and that parents traversed a *continuum of support* (Hasler Waters, Menchaca, & Borup, 2014). The parents offered varying degrees of assistance based on what they believed their students needed as well as the expectations they held for their students' academic achievement. By leveraging their intimate awareness of their students' needs, parents were strategic in how they helped their students structure their learning time and space. Consistent with students at this stage of development (Hawk, Keijsers, Hale, & Meeus, 2009; Smetana, Daddis, & Chuang, 2003), some students

pushed back, wanting more freedom to choose when and how they engaged in schoolwork. Some parents recognized the importance of encouraging their students to take ownership of their learning, and when possible gave them a level of control over their learning.

This research also identified types of parental engagement at a cyber charter high school. We discovered that the types of behaviors parents engaged in to support their students involved in this study are most accurately grouped in five categories: (1) nurturing relationships and interactions, (2) advising and mentoring, (3) organizing, (4) monitoring and motivating student engagement, and (5) instructing. We surmise that the categories of parental engagement behaviors found among the group of parents involved in this study are slightly different than those found in the earlier research, because the students involved in this study were high school students, not elementary or middle school students.

First, parents nurtured their own relationships with their students by building trust and supporting students' endeavors. While nurturing students is a natural phenomenon, the data collected from this study highlighted the significant role nurturing played as a driver of other forms of parental engagement. Similarly, parents in another study reported that they found the opportunity to nurture their students to be one of the most rewarding aspects of being their students' learning coach (Hasler Waters, 2012). Students also appeared to value the love and trust they found from their parents. This finding corroborates Borup et al.'s (2013) study in which students reported that they valued their parents' engagement more than parents realized. Similarly, one parent, Laura, reported that her son did not want her involved in his learning. However, her son, Ivan, admitted that his mothers' involvement was "annoying" but effective. In this study, parents also encouraged their students to build relationships with their teachers. For previously homeschooled students this was especially important, since they did not have teachers before attending MHA. This responsibility for students to establish a relationship with their teachers was not originally included in the ACE framework but supports teacher perceptions in the same setting (Borup, 2015).

Second, parents advised and mentored students by helping them make prudent decisions in order to set themselves up for future opportunities. Similarly, Curtis (2013) identified mentoring as a major type of parental engagement at a cyber high school and found that mentoring was an extension of how parents showed their love of their students. As a result, there appears to be a close relationship between parents' nurturing and advising activities. From the outset, parents chose to enroll their students in MHA based on what they believed would be the best learning environment for their students. Ni and Rorrer (2012) explained that the very act of enrolling students in a charter school is an indication that parents are proactively involved in their students' learning. As a result, parents' advising and mentoring activities may be different at non-charter-school programs.

Parents' mentoring and advising activities can also vary based on student characteristics. For instance, Beck and his colleagues (Beck, Egalite, & Maranto, 2014; Beck, Maranto, & Lo, 2013) found that parents of special education students were more likely than parents of general education students to enroll their students in a cyber school to avoid bullying and other social issues at their brick-and-mortar school. Parents of special education students were also more satisfied with their students' cyber school than were parents of general education students. In addition to advising students to enroll in online courses, de la Varre et al. (2014) observed that parents also advised their students to drop out of online programs when students' performance was low, when students were unable to fully engage in extracurricular activities, or when the course content "went against their family's values" (p. 10).

The third responsibility parents assumed was helping their students to organize their learning time and space. This was important in order to help their students stay on track and focused. Lowes and Lin (2015) stated, "As online learning has grown, it has become increasingly clear to many of us working in the field that students not only need to learn a subject online but need to learn how to learn online" (p. 18). Parents in our research also recognized this need and found that students were especially lacking in their ability to manage their time and space. Some parents tried to create multiple learning spaces and

flexible schedules in order to give their students choices. Some found that it was ineffective to set strict schedules, because some course work took longer than others, and students had other priorities to manage. Students also desired more independence, and some would ignore the schedule that parents provided. Household distractions proved challenging for some, and prioritizing family needs over schooling was problematic for some students. This may be especially surprising to students and parents, because one of the primary rationales that students and parents provide for enrolling in online courses is to escape the distractions (Garthwait, 2014; Muller, 2010; Sorensen, 2012).

Fourth, parents set expectations for student performance and then motivate students to meet those expectations. Motivating students required parents to monitor student behavior and performance. Monitoring student behavior is especially important within an online learning environment because the same technology that students use to access the course content can also be used to access limitless distractions (McFarlane, 2011). Some parents admitted that it was challenging to know exactly what their students were doing and relied on data collected from the LMS and communications from the teachers to stay abreast. Parents commonly used praise and words of encouragement to motivate student engagement. However, when students still failed to meet expectations, parents adjusted how they organized their students' learning time or used their intimate awareness of their students to incentivize them with either reinforcements or punishments. In most instances, students were grateful for the level of monitoring and motivating from their parents because they found it helped them stay on track. Yet not all students appreciated the amount of parental oversight they received, as they believed that it undermined their independence. Regardless, parents appeared to be largely successful at motivating students. Similarly, Hasler Waters (2012) observed that parents were constantly adapting their strategies to keep their students motivated, and they frequently leveraged external resources, from downloading online apps to enlisting the support of other family members, to keep their students engaged. It is difficult to overemphasize the importance of parents' monitoring and motivating efforts. Murphy and Rodríguez-Manzanares (2009) summarized that in order to be successful, many online students require the physical presence of someone who is "actively encouraging or pushing them" (p. 11).

Lastly, parents engaged in both direct and indirect instruction to support student learning. Findings from this research supported Liu et al. (2010), who suggested that parental involvement could in fact boost a child's ability to acquire and practice skills necessary to be successful in virtual learning environments—including perseverance, organization, internal locus of control, technology, and time management skills. When needed, students would also request their parents' instructional assistance on assignments. However, some of the data collected indicated that some parents might have done work for the students. Some teachers have complained about the troubling effects that may occur when parents actually do the work for their students or fail to communicate with teachers about the learning challenges their students experience (Borup, 2015; Hasler Waters & Leong, 2014). Parents relied on teachers to provide most of the direct instruction to their students and only intervened when the teacher was unavailable. Most often, parents worked to learn the content alongside their students. The students valued these shared learning experiences, as they helped students to build their confidence and were seen as motivational. Parents also helped their students to develop good study habits, such as taking notes. Where teachers tend to provide this type of guidance in the traditional classroom, parents' physical proximity to students made them especially effective at providing this type of support.

It is imperative that parents receive communication from the school to help them better understand the importance of their responsibilities and strategies to best engage in their students' learning (Boulton, 2008). Knowing that their parents and teachers worked together to support their learning was also reassuring to students. For the most part, parents valued teacher communications, but some parents were not always pleased with the level of teacher support they received. Challenges over sharing the teaching space and fully understanding the split of roles and responsibilities between parents and teachers in this type of environment are not new. Research has pointed to this theme for nearly two decades,

beginning with Litke's (1998) study of parental involvement in a cyber charter school and reoccurring throughout more recent studies (Boulton, 2008; Hasler Waters & Leong, 2014; Hawkins, 2011). The ACE Framework has identified areas of overlap between instructor and parent roles and suggested that students would benefit if these shared responsibilities were better coordinated (Borup et al., 2014). In the next section, we conclude with possible implications for researchers and practitioners who wish to better understand and facilitate effective parental engagement and collaborative relationships with teachers.

Conclusions and Implications

In this case study we conducted 10 interviews with 10 students and 19 interviews with 9 of their parents at MHA, a full-time online charter high school. Our analysis identified five primary types of parental engagement within this setting: (1) nurturing relationships and interactions, (2) advising and mentoring, (3) organizing, (4) monitoring and motivating student engagement, and (5) instructing. Prior to discussing possible implications of this research, we first need to understand its limitations. Although we were able to support parent perceptions with those of students, a major limitation of this research was the exclusive reliance on interview data. Greene, Caracelli, and Graham (1989) explained that the "use of only one method to assess a given phenomenon will inevitably yield biased and limited results" (p. 256). Furthermore, as is true with any case study, this research was highly contextualized, and practitioners and researchers should avoid "the temptation to read too far beyond the case itself in speculating about its meaning or implications" (p. 37). It is likely that research conducted in cyber schools with different learning models or younger students would produce different results.

Implications for Practice

In this research we found four primary obstacles to parental engagement at MHA: (1) time constraints, (2) conflict with their students, (3) ambiguity regarding their responsibilities, and (4) a perception that some forms of engagement were unwelcomed by teachers. Although there is little that schools can do to alleviate parents' external time constraints, they can help parents fulfill their responsibilities more efficiently. For instance, MHA teachers sent regular progress reports to parents individually to assist them in their monitoring responsibilities. Schools could make this process more efficient for parents if they sent them one weekly e-mail that contained student progress across all courses. Parents also found the activity reports provided by the LMS to be helpful, supporting Cavanaugh's (2009) previous suggestion that online programs provide parents with their students' analytic data. However, parents found that these activity reports were long, and to understand them was time consuming. Zhang and Almeroth (2010) advocated for teacher dashboards that would display trends in students' online activity and performance in ways that allow teachers to more quickly recognize and respond to student needs. Similar dashboards would also help parents to more effectively and efficiently fulfill their responsibilities.

Second, student–parent conflict proved to be an obstacle for some parents. Although it is not unusual for there to be conflict in the home when adolescents try to establish their independence from parents (Hawk, Keijsers, Hale, & Meeus, 2009; Smetana et al., 2003), this phenomenon has yet to be fully explored in full-time online settings. It is possible that student–parent conflict is more likely to occur in an online learning environment than in a brick-and-mortar setting because parents have more contact with their students and are required to assume some of the roles that are performed by classroom teachers. As a result, cyber schools should warn parents of possible student–parent conflict—especially when conflict already exists. Steinberg (2001) explained that researchers' understanding of parent–adolescent conflict has evolved over time. Traditionally, parent–adolescent conflict was viewed as inevitable, and parents were told to "expect oppositionalism and defiance from their teenagers and to worry if these factors were not present" (p. 3). However, there is an increasing body of evidence that conflict is not a natural byproduct of effective parenting. Similarly, we found that it was possible for most parents to fulfill their responsibilities with little or no evidence of parent–student conflict. As a result, online programs should

recognize the common triggers for excessive parent–student conflict and work with parents to develop strategies that prevent and resolve conflict when it occurs.

Third, some parents were somewhat unsure of their responsibilities and how to fully support their students' learning. One parent had the following realization at the start of the year: "Wow! [My student] needs much more help here than I ever thought." Parent misconceptions appeared to result in some parents' distracting students from their work and, in at least one case, actually doing the student's work for him. This is not a phenomenon unique to online learning (Cooper, 1989), but parents of online students have more opportunities to interfere with their students' learning than parents of students in a traditional brick-and-mortar environment. To MHA's credit, it worked to educate parents regarding their responsibilities at a face-to-face orientation meeting, but greater success may have been achieved if parents had also received recommendations and strategies throughout the year that focused on common challenges and misconceptions among parents.

Fourth, parental interference may have resulted in teachers wanting to keep parents at "arm's length," as expressed by one parent. Hasler Waters and Leong (2014) also found that online teachers were reluctant to share instructional responsibilities with parents even when it would have benefited the student. As a result, cyber schools may find that they need to better educate parents *and* teachers regarding the potential benefits of parental engagement as well as specific ways that parents should and should not engage in their students' learning.

Implications for Research

As stated earlier, researchers have largely ignored parental engagement at cyber high schools despite a consensus within the educational community that parental engagement can benefit students. Rice (2006) explained that part of the blame for the lack of research in K-12 online learning can be "placed on the doorstep of the research community for a lack of theoretical rational" (p. 440). Although Rice made the statement nearly a decade ago, the same holds true today. This is especially true with parental engagement, a variable that has proved difficult to define in online settings. For instance, Curtis's (2013) and Borup et al.'s (2014) parental engagement frameworks initially appear more different than they actually are because they use different terms to describe similar phenomena. One challenge to developing unified definitions is that researchers often fail to cite each other's research. This is due in part to the fact that K-12 online and blended learning research represents only a small portion of the total research published in the seemingly endless number of journals in the larger field of instructional design and technology. Additionally, much of the research on K-12 online and blended learning is published only as reports, white papers, and dissertations. The latter is an especially rich source of research that deserves more attention. Drysdale, Graham, Spring, and Halverson (2013) argued, "An understanding of trends in dissertation research can show what issues, theories, and methodologies young researchers and their faculty mentors are interested in" (p. 91). Thankfully, there have been recent attempts to highlight and distribute K-12 online and blended learning research, including this and other journals' special issues on the subject. The Michigan Virtual Learning Research Institute (MVLRI) and iNACOL led an effort to create a clearinghouse for all forms of K-12 online and blended learning research (http://k12onlineresearch.org/). Furthermore, in 2014 the *Handbook of Research on K-12 Online and Blended Learning* (Ferdig & Kennedy, 2014) was published, and in 2015 the first issue was published of the *Journal of Online Learning Research,* a journal devoted solely to issues pertaining to K-12 online learning. These and other efforts have the potential to create a stronger research community and result in more coordinated research efforts.

The ACE framework was selected to guide this research and proved helpful in identifying and defining types of parental engagement within this research context. However, our analysis extended beyond the ACE framework's original description of parental engagement. For instance, we expanded the ACE framework's concept of *nurturing* to also include parents' responsibilities to foster student–teacher

and parent–teacher communications. We also added the concept of *advising and mentoring*, which was not originally identified within the ACE framework. Whetten (1989) explained that when establishing a framework, researchers should "err in favor of including too many factors, recognizing that over time their ideas will be refined" (p. 490). Similarly, the authors of the ACE framework stated that the framework was not a comprehensive list of factors that influence student engagement, and they anticipated that qualitative research "could refine and/or expand" (Borup et al., 2014, p. 123) the framework. However, Merriam (1998) explained that case studies should not be viewed as a way of "testing" the hypotheses inherent within the framework.

Additional insights into parental engagement could also be obtained by conducting research in a variety of settings and by analyzing additional types of data, such as actual parent–teacher e-mail communications. Once researchers have identified and defined the various types of parental engagement, they can work to create and validate instruments to quantitatively measure parent engagement. These types of instruments would allow researchers to identify the types of parental engagement that are most strongly correlated with course outcomes. Although this type of research can be difficult—especially when collecting data from minors, it can prove insightful to those wishing to improve learning outcomes and reduce online attrition rates.

References

Barbour, M. K. (2013). The landscape of K-12 online learning: Examining what is known. In M. G. Moore (Ed.), *Handbook of distance education* (3rd ed., pp. 574–593). New York: Routledge.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, *13*(4), 544–559. doi:10.2174/1874434600802010058

Beck, D., Egalite, A., & Maranto, R. (2014). Why they choose and how it goes: Comparing special education and general education cyber student perceptions. *Computers & Education*, *76*, 70–79. doi:10.1016/j.compedu.2014.03.011

Beck, D. E., Maranto, R., & Lo, W.-J. (2013). Determinants of student and parent satisfaction at a cyber charter school. *The Journal of Educational Research*. doi:10.1080/00220671.2013.807494

Black, E. W. (2009). *An evaluation of familial involvements' influence on student achievement in K-12 virtual schooling* (Doctoral dissertation). University of Florida, Gainesville, FL. Retrieved from http://search.proquest.com/docview/304883948?accountid=4488

Borup, J. (2015). Teacher perceptions of parental engagement at a cyber school. In D. Slykhuis & G. Marks (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2015* (pp. 1463–1469). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Borup, J., Graham, C. R., & Davies, R. S. (2013). The nature of parental interactions in an online charter school. *American Journal of Distance Education*, *27*, 40–55. doi:10.1080/08923647.2013.754271

Borup, J., West, R. E., Graham, C. R., & Davies, R. S. (2014). The Adolescent Community of Engagement: A framework for research on adolescent online learning. *Journal of Technology and Teacher Education*, *22*(1), 107–129.

Boulton, H. (2008). Managing e-Learning: What are the real implications for schools? *The Electronic Journal of E-Learning*, *6*(1), 11–18.

Cavanaugh, C. (2009). *Getting students more learning time online*. *Distance education in support of expanded learning time in K-12 schools*. Washington, DC: Center for American Progress. Retrieved from https://www.americanprogress.org/wp-content/uploads/issues/2009/05/pdf/distancelearning.pdf

Cavanaugh, C., Barbour, M., Brown, R., Diamond, D., Lowes, S., Powell, A., … Van der Molen, J. (2009). *Research committee issues brief: Examining communication and interaction in online teaching*. Vienna, VA: iNACOL. Retrieved from http://www.inacol.org/wp-content/uploads/2015/02/iNACOL-ExamingCommunicationAndInteraction-2009.pdf

Cooper, H. (1989). Synthesis of research on homework. *Educational Leadership*, 85–91.

Curtis, H. (2013). *A mixed methods study investigating parental involvement and student success in high school online education* (Doctoral dissertation). Northwest Nazarene University, Nampa, ID.

de la Varre, C., Irvin, M. J., Jordan, A. W., Hannum, W. H., & Farmer, T. W. (2014). Reasons for student dropout in an online course in a rural K–12 setting. *Distance Education*, *35*(3), 324–344. doi:10.1080/01587919.2015.955259

Drysdale, J. S., Graham, C. R., Spring, K. J., & Halverson, L. R. (2013). An analysis of research trends in dissertations and theses studying blended learning. *The Internet and Higher Education*, *17*, 90–100. doi:10.1016/j.iheduc.2012.11.003

Ferdig, R. E., & Kennedy, K. (Eds.). (2014). *Handbook of research on K-12 online and blended learning*. Pittsburgh, PA: ETC Press. Retrieved from http://press.etc.cmu.edu/files/Handbook-Blended-Learning_Ferdig-Kennedy-etal_web.pdf

Freidhoff, J. R. (2015). *Michigan's K-12 virtual learning effectiveness report 2013-2014*. Lansing, MI: Michigan Virtual Learning Research Institute. Retrieved from http://media.mivu.org/institute/pdf/er_2014.pdf

Garthwait, A. (2014). Pilot program of online learning in three small high schools: Considerations of learning styles. *E-Learning*, *12*(4), 353–365.

Glaser, B. G. (1965). The constant comparative method of qualitative analysis. *Social Problems*, *12*(4), 436–445. Retrieved from http://www.jstor.org/stable/798843

Graham, C. R., Henrie, C. R., & Gibbons, A. S. (2014). Developing models and theory for blended learning research. In A. G. Picciano, C. D. Dziuban, & C. R. Graham (Eds.), *Blended learning: Research perspectives* (Vol. 2, pp. 13–33). New York, NY: Taylor & Francis.

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 11*(3), 255–274. doi:10.3102/01623737011003255

Hasler Waters, L. (2012). *Exploring the experiences of learning coaches in a cyber charter school: A qualitative case study*. Retrieved from Retrieved from http://search.proquest.com/docview/1347666490?accountid=4488.

Hasler Waters, L., Barbour, M. K., & Menchaca, D. M. P. (2014). The nature of online charter schools: Evolution and emerging concerns. *Educational Technology & Society, 17*(4), 379–389.

Hasler Waters, L., & Leong, P. (2014). Who is teaching? New roles for teachers and parents in cyber charter schools. *Journal of Technology and Teacher Education, 22*(1), 33–56.

Hasler Waters, L., Menchaca, M. P., & Borup, J. (2014). Parental involvement in K-12 online and blended learning. In R. E. Ferdig & K. Kennedy (Eds.), *Handbook of research on K-12 online and blended learning* (pp. 325–346). ETC Press.

Hawk, S. T., Keijsers, L., Hale, W. W., & Meeus, W. (2009). Mind your own business! Longitudinal relations between perceived privacy invasion and adolescent-parent conflict. *Journal of Family Psychology, 23*(4), 511–520. doi:10.1037/a0015426

Hawkins, A. (2011). *"We're definitely on our Own": Interaction and disconnection in a virtual high school* (Doctoral dissertation). Brigham Young University, Provo, UT.

Hoover-Dempsey, K. V., & Sandler, H. M. (1995). Parental involvement in children's education: Why does it make a difference? *Teachers College Record, 97*(2), 311–331.

Hoover-Dempsey, K. V., & Sandler, H. M. (2005). *Final performance report for OERI grant # R305T010673: The social context of parental involvement: A path to enhanced achievement*. Washington, D.C.

International Association for K-12 Online Learning (iNACOL). (2012). *Fast facts about online learning*. Vienna, VA: INACOL. Retrieved from http://www.inacol.org/press/docs/nacol_fast_facts.pdf

Klein, C. (2006). *Virtual charter schools and home schooling*. Youngstown, NY: Cambria Press.

Litke, D. (1998). Virtual schooling at the middle grades: A case study résumé. *The Journal of Distance Education, 13*(2), 33–50.

Liu, F., Black, E., Algina, J., Cavanaugh, C., & Dawson, K. (2010). The validation of one parental involvement measurement in virtual schooling. *Journal of Interactive Online Learning, 9*(2), 105–132.

Lowes, S., & Lin, P. (2015). Learning to learn online: Using locus of control to help students become successful online learners. *Journal of Online Learning Research, 1*(1), 17–48.

McFarlane, D. A. (2011). Are there differences in the organizational structure and pedagogical approach of virtual and brick-and-mortar schools? *Journal of Multidisciplinary Research, 3*(2), 83–98.

McNeal, R. B. (2012). Checking in or checking out? Investigating the parent involvement reactive hypothesis. *Journal of Educational Research, 105*(2), 79–89.

Merriam, S. B. (1998). *Qualitative research and case study applications in education: Revised and expanded from case study research in education*. San Francisco, CA: Jossey-Bass.

Miron, G., & Gulosino, C. (2015). Full-time virtual schools: Enrollment, student characteristics, and performance. In A. Molnar (Ed.), *Virtual schools in the U.S. 2015: Politics, performance, policy, and research evidence.* Boulder, CO: National Education Policy Center Retrieved from http://nepc.colorado.edu/publication/virtual-schools-annual-2015

MHA (Mountain Heights Academy). (2015). Mission statement. Retrieved from http://www.mountainheightsacademy.org/mission-statement/

Muller, E. (2010). *Virtual K-12 public school programs and students with disabilities: Issues and recommendations*. Alexandria, VA. Retrieved from http://projectforum.org/docs/VirtualK-12PublicSchoolProgramsandSwD-IssuesandRecommendations.pdf

Murphy, E., & Rodríguez-Manzanares, M. A. (2009). Teachers' perspectives on motivation in high school distance education. *Journal of Distance Education, 23*(3), 1–24.

Ni, Y., & Rorrer, A. K. (2012). Twice considered: Charter schools and student achievement in Utah. *Economics of Education Review, 31*(5), 835–849. doi:10.1016/j.econedurev.2012.06.003

Noel, A., Stark, P., Redford, J., & Zuckerberg, A. (2013). Parent and family involvement in education, from the National Household Education Surveys Program of 2012 (NCES 2013-028). *Education Statistics, Institute of Education.* Retrieved from http://nces.ed.gov/pubsearch

Rice, K. L. (2006). A comprehensive look at distance education in the K-12 context. *Journal of Research on Technology in Education, 38*(4), 425–449.

Russell, G. (2004). Virtual schools: A critical view. In C. Cavanaugh (Ed.), *Development and management of virtual schools: Issues and trends* (pp. 1–25). Hershey, PA: Information Science Publishing.

Shoaf, L. (2007). Perceived advantages and disadvantages of an online charter school. *American Journal of Distance Education, 21*(4), 185–198. doi:10.1080/08923640701595191

Smetana, J. G., Daddis, C., & Chuang, S. S. (2003). "Clean your room!": A longitudinal investigation of adolescent-parent conflict and conflict resolution in middle-class African American families. *Journal of Adolescent Research, 18*(6), 631–650. doi:10.1177/0743558403254781

Sorensen, C. (2012). Learning online at the K-12 level: A parent/guardian perspective. *International Journal of Instructional Media, 39*(4), 297–308.

Stake, R. E. (2010). *Qualitative research: Studying how things work*. New York, NY: Guilford Press.

Steinberg, L. (2001). We know some things: Parent–adolescent relationships in retrospect and prospect. *Journal of Research on Adolescence, 11*(1), 1–19. doi:10.1111/1532-7795.00001

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2013). *Keeping pace with K-12 online & blended learning: An annual review of policy and practice*. Evergreen Education Group. Retrieved from http://kpk12.com/cms/wp-content/uploads/EEG_KP2013-lr.pdf

Whetten, D. A. (1989). What constitutes a theoretical contribution? *The Academy of Management Review*, *14*(4), 490–495. doi:10.2307/258554

Wolcott, H. F. (1994). *Transformative qualitative data: Description, analysis, and interpretation*. Thousand Oaks, CA: Sage Publications.

Zhang, H., & Almeroth, K. (2010). Moodog: Tracking student activity in online course management systems. *Journal of Interactive Learning Research, 21*(3), 407–429.

Book Review: *Handbook of Research on K-12 Online and Blended Learning*

Diane Mayse,PhD
Blended Learning Data Manager (Nexus Academies)
Connections Education

Editors: Richard E. Ferdig and Kathryn Kennedy (2014). *Handbook of Research on K-12 Online and Blended Learning.* Pages: 540. Published by ETC Press. ISBN: 978-1-312-58708-3. The online version is available for no charge at http://press.etc.cmu.edu/content/handbook-research-k-12-online-and-blended-learning-0. The printed version is $33.95.

Introduction

The *Handbook of Research on K-12 Online and Blended Learning*, which is edited by Richard E. Ferdig and Kathryn Kennedy, is designed to be a collection of what is currently known about research in the field of K-12 online and blended learning and to serve as a resource for researchers, practitioners, and policy makers.

Richard Ferdig is an accomplished researcher and current professor of Learning and Instructional Technologies at Kent State University. His research, teaching, and service work focus on combining cutting-edge technologies with current pedagogic theory to create innovative learning environments, such as educational games and simulations. Ferdig is also the editor-in-chief of the *International Journal of Gaming and Computer Mediated Simulations* and the associate editor-in-chief of the *Journal of Technology and Teacher Education*. He currently serves as a consulting editor for the development editorial board of *Educational Technology Research and Development* and on the review panel of the *British Journal of Educational Technology*.

Kathryn Kennedy is an award-winning teacher, researcher, and professor in the area of curriculum and instruction with a focus on educational technology. Kennedy is a senior researcher at the Michigan Virtual Learning Research Institute (MVLRI)—an organization with the goals of supporting new learning models, engaging in active research to inform new policies in online and blended learning, and strengthening the infrastructure for sharing best practices. She was awarded the International Association

for K-12 Online Learning (iNACOL) Online Learning Innovator Award for Outstanding Research in 2010 and 2012.

The intended audience of this book includes anyone working, researching, teaching, or interested in learning more about K-12 online and blended learning.

The editors' purpose was to create a publicly available, free online resource to begin to synthesize the various strands of research in K-12 online and blended learning into one comprehensive catalogue.

The editors' thesis is that this resource will strengthen further research in the K-12 online and blended learning field by clarifying what is currently known and what is currently unknown; provide empirical resources for researchers, educators, administrators, and policy officials; and begin a process of annually reexamining research in the field.

Organization/Structure

The *Handbook* is organized into six sections, each representing a category of K-12 online and blended research: background and history, learner research, content domain, teaching, preparation and mentoring for support roles, and technological innovations.

The first section orients the reader to the historical context of K-12 online and blended learning research as a foundation for understanding the more specific areas of research that follow. The historical overview covers research from the United States and across the world, and reviews policies and research methods used in K-12 online and blended learning.

Each of the remaining topics is presented with an introduction; discussion of the literature; implications for policy, practice, and research; a conclusion; and references. Within each section, two to five authors provide an overview and synthesis of more specific research topics, such as

- learners and learning environments;
- learning in the content domains of math, literature, and physical education;
- teaching, mentoring, and teacher preparation programs;
- administrators, school psychologists, onsite and virtual facilitators, school libraries, and the support role of parents; and
- technological innovations in mobile, open, and personalized learning.

The information Ferdig and Kennedy present is an accurate reflection of the current state of research in each of these domains. The book draws on the research and reflections of key contemporary researchers and provides a solid presentation across several subtopics within each domain, with the goal of creating an ongoing conversation with readers about research in each field. The editors even provide an e-mail address (handbookresearch@gmail.com) so that readers can suggest areas for additional research.

Assessment of Significance to the Field of Distance Education Theory, Research, and/or Practice

Research presented throughout the book spans from 1994 to the present for internationally based research, and from 2000 to the present for U.S.-based research, with the majority of research cited having been published within the past five years.

By organizing the framework into six broad themes and then selecting a variety of studies representing various subtopics within each theme, the editors give the reader the opportunity to engage with key research ideas across many related areas of interest.

A major strength is the broad reach of topics combined with a specific focus on exemplar research studies synthesized by the contributors—a collection of the field's leading researchers. In addition, information is presented concisely, and identifies key programs, dates, and relevant details. The book is conveniently organized with descriptive headings and subheadings for easy referencing, and definitions of important terms are provided. Furthermore, each section's introduction connects to the ideas of the sections that came before it, creating smooth transitions throughout.

Another strength of the *Handbook* is that the editors note additional areas of research they view as missing from each section of the current iteration of the *Handbook*, which include program evaluation, cultural perspectives and understanding diversity, English language learners, appreciation of change in school cultures, and a continued exploration of the relationships between traditional, online, and blended learning environments. Many relevant reports and research studies are referenced throughout the *Handbook* in support of its stated collaborative nature.

I hope the editors continue with their mission to expand the areas of research covered in the *Handbook* and to build upon conversations with readers to determine the future direction and goals of this resource.

As the first work of its kind in this area, directly comparable works do not currently exist. The Evergreen Consulting group publishes the *Keeping Pace* report each year in partnership with iNACOL. This report provides snapshots of the demographic landscape of online and blended learning and works to continually redefine the various program components of blended and online programs. Nothing currently exists, however, that covers the scope of the *Handbook's* broader themes, with the goal of centralizing and synthesizing K-12 online and blended learning research.

The *Handbook* is well designed, well written, and humorous throughout. Ferdig and Kennedy have included research experts from across the field to guide discussions in each category with the reader. The *Handbook* includes key research resources for each thematic category and suggestions for additional research directions. For these reasons, the *Handbook of Research on K-12 Online and Blended Learning* is a valuable contribution to the literature of distance education theory, research, and best practices.

Book Review: *Online, Blended, and Distance Education: Building Successful Programs in Schools*

Anne Roycroft, EdD
Fuel Education

Editors: Tom Clark and Michael Barbour. (2015). *Online, Blended, and Distance Education: Building Successful Programs in Schools*. Sterling, VA: Stylus Publishing. 239 pages. ISBN: 978-1-62036-163-4 (cloth)

Editors Tom Clark and Michael Barbour assemble an array of research and case studies from some of today's leading scholars in digital learning in this user-friendly compilation. With over 30 years of experience in online learning research between them, Clark and Barbour's wisdom is evident in their choices of contributors and themes. The book provides a greatly needed overview of research in online teaching and learning, which also shows that there is ample opportunity for investigation and innovation. Chapters on instructional design, technology infrastructure, and equitable access provide useful summaries for program planning, while the variety of case studies will no doubt trigger expanded investigation and future study.

Clark and Barbour anchor Part One of their book with an "Overview" chapter. This chapter is an essential historical chronology, going back to educational radio and other distance education programs in 1921. Their brief review reminds us just how far digital learning has come, and in a relatively short time.

Part Two, "Research and Practice," assembles six chapters on useful topics for practitioners and beginning researchers. The chapters establish common definitions, provide a historical and thematic review essential to our understanding of digital learning today, add evidence from a variety of implementations, and add a necessary global perspective to the book.

Chapter 2, written by Kathryn Kennedy and Leanna Archambault, explores quality online teaching. Central to their chapter is an overview of the research on online learning already available and information about the current standards for online teaching published by Southern Region Education Board (SREB) and the International Association for K-12 Online Learning (iNACOL). They also provide a brief look at the ways online teaching is supported through teacher education, preservice, and in-service programs, which they argue are critical next steps for quality online programming.

In Chapter 3, Christy Keeler focuses on instructional design and explores some of the ways online courses are developed as commercial products. While Keeler's general observations about the models of design

may not hold true for all courses today, the chapter is an essential starting point for understanding online course development, student–teacher communication, instructional strategies, and assessment strategies. Keeler concludes, appropriately, with a reminder that new opportunities are quickly gathering steam, so important updates are warranted for this section.

As with Keeler's work, Chapter 4, authored by Rob Darrow, will need a continual update, as the world of online technology moves so quickly. Darrow focuses on the technology infrastructure necessary for online programs today and provides important decision-making tips for administrators and technology leaders. While Darrow references mobile technologies, Web 2.0 tools, social media, social constructivism, and OER, a summary of the avalanche of innovation that has since occurred in each of those areas would make valuable addendum.

In Chapter 5, Richard Ferdig, Cathy Cavanaugh, and Joe Friedhoff explore research in K-12 online and blended learning, while Chapter 6 is an exploration of cyber charter schools by Victoria Raish and Ali Carr-Chellman. Both chapters remind us about the frequently debated question, "Does online learning work?" and point out the quality disparity prevalent in online courses and programs.

Clark and Barbour conclude Part Two of their book with a must-read chapter on accessibility by Ray Rose, Alese Smith, Karen Johnson, and David Glick. The authors not only provide a helpful checklist in their appendix but also point out some of the common issues of access that must be addressed when planning new programs and updating existing ones. Whether through district firewalls or restrictive conditions for individual student access, such as pretests, programs often unknowingly limit equitable access to online resources. The reader will be surprised that the chapter is focused as much on implementation by teacher and school as it is on instructional design and web development.

The case studies that dominate Part Three of the book allow us to see the many ways online and blended learning have been used, evaluated, and modified in noteworthy programs around the world. Chapters 8 through 16 also provide examples for readers to follow, whether in research design or program innovation. Clark and Barbour provide us with a smorgasbord of short studies, from an impact study with the North Carolina Virtual Public School to a report on the implementation of a variety of blended charter schools across the United States, and from a case study on a public virtual high school in Clark County, Nevada, to a study of an online private school in Ontario, Canada. Other international studies from Nepal, Australia, the United Kingdom, and Korea provide an impressive variety of evidence of the global potential of digital learning. A nice addition to these studies is Chapter 9, the story of the development of the online teaching endorsement program at Boise State University, by Dazhi Yang and Kerry Rice. As Cathy Cavanaugh notes in her foreword, models such as those presented in this book help us learn from the successful experiences and innovations of trailblazers, as well as from their missteps.

Clark and Barbour conclude with Part Four, a summary not only of the book but also of the themes shared by its writers. They attempt to decipher the best practices and themes that will impact the future of digital learning and present their perception of eight key trends. They set the stage for the next edition as we watch for innovation to lead us to growth in personalized learning opportunities for students, among other exciting opportunities.

This book is a smart selection for administrators and technology coordinators, and a timely supplement for college-level courses in school improvement, online teaching and learning, policy, and leadership. Online teachers and leaders will find the book helpful in reflecting on the accomplishments of the blended and online learning movement but also a reminder of the potential that still remains. Graduate students will find the book a useful introduction to research, with an abundance of ideas for new projects.

Section II: Additional Articles: Planning, Design and Evaluation

UDL in Online College Coursework: Insights of Infusion and Educator Preparedness

LaRon A. Scott, Ed.D.
Peter Temple, M.S.
David Marshall, M.A.
Virginia Commonwealth University

Abstract

Teacher education programs are increasing the use of online courses to train and prepare teachers. The Universal Design for Learning (UDL) framework is one strategy used to effectively train and prepare special education teachers in the online learning environment. The purpose of this study was to examine participants' perception of UDL in online graduate-level courses and their preparation after completing the online courses using UDL. Mean ratings are reported for course alignment with UDL principles as are teacher preparation ratings. Participants reported that they perceived the online courses to be aligned with the UDL principles and that their learning and preparation was positively impacted. The results contribute to the application of these findings to online coursework and teacher preparation. Limitations and implications are discussed.

Introduction

Enrollment in online courses at the postsecondary level has grown at a rapid pace over the past decade (Allen & Seaman, 2014). In 2002, approximately 1.6 million students, or 9.6% of all students attending postsecondary institutions in the United States, were enrolled in an online course (Allen & Seaman, 2003). By 2010, 6.1 million students participated in at least one online course (Allen & Seaman, 2011). This represents a large increase (281%), when compared to the overall growth in postsecondary enrollment during the same time period (18.1%). The National Center for Education Statistics (NCES) recently released data showing that roughly one in every ten students in post-secondary education are

exclusively enrolled in online programs (NCES, 2014). With this growing population of students, universities are trying to develop online coursework equivalent to their traditional, in-class counterparts. However, there are concerns over whether online learning can truly prepare highly effective and qualified teachers. Those who challenge the efficacy of online teacher preparation perceive online coursework as less rigorous when compared to face-to-face preparation (Columbaro & Monaghan, 2009); pedagogy associated with online instruction as second-rate (Cox, 2005); and limited face-to-face interaction between instructor and student which leads to poor preparation and low online course completion (Bambara, Harbour, Davies, & Athey, 2009). However, for teacher preparation programs (both traditional and online) that are not producing enough qualified teachers to keep up with teacher shortages—particularly in the area of special education (Thornton, Peldier, and Medina, 2007)—online coursework offers the ability to reach and prepare more individuals that are ready and able to educate the next generation of students. This is especially true for bilingual education teachers (Kennedy, 2013), STEM teachers (Hutchison, 2012), and special education teachers (Thornton, Peldier, and Medina, 2007) that often lead the list of critical shortages of teachers across the nation.

These ongoing discussions regarding the quality of online coursework has generated a conversation about the online preparation of teachers. Universal Design for Learning (UDL) has been widely accepted as a framework for meeting the various needs of students in a traditional setting (Smith, Polloway, Patton, & Dowdy, 2001; Mcguire, Scott, & Shaw, 2006; Jimenez, Graf, & Rose, 2007; Meo, 2008; Powell & Powell, 2010; Gargiulo & Kilgo, 2013). UDL, which has a specific focus on accessibility of learning, has emerged as a possible way to enhance the quality of coursework and preparation of students enrolled in online programs. UDL as a framework for online coursework and preparation might ensure a quality learning experience for students. It may also help teacher preparation programs seeking to design and deliver quality instructional experiences for students, and help college programs maintain a level of quality that will improve online teacher preparation. After a thorough review of the literature, we infused UDL into our online coursework, and have come to several notable conclusions regarding its use in postsecondary online environments.

Literature Review

With the increase in online courses, some have questioned the efficacy of online coursework compared to their traditional counterparts in terms of student academic success (Taylor & Maor, 2000; Herman & Banister, 2007; Mebane et al, 2008; Clay, 2012). Xu and Jaggars (2011) challenged the notion that online courses have academic success rates equivalent to face-to-face, traditional university formats. Their study found participants enrolled in online English courses were less successful academically than their traditional counterparts with end of semester final grade averages of 74% and 77%, respectively (Xu & Jaggars, 2011). However, this study did not address or compare the student participation and academic success in online coursework. More recent research has found a significant relationship exists between student participation in online coursework and the likelihood of attaining passing grades (Tayebinik & Puteh, 2013). He (2013) found a positive correlation between the number of questions students asked and regular online class attendance and final grades. This ties in with the engagement factor that more teachers are implementing in the classroom—the more engaged students are, the better their overall academic scores (CAST, 2008; He, 2013).

Teaching an online course is different than traditional classroom instruction. Faculty at multiple universities report a higher level of effort required to teach online courses, utilizing different skillsets (Andresen, 2002; Tanner, Noser, & Taro, 2009; Morra & Reynolds, 2010). Instructors need to balance the promotion and guiding of amorphous online instruction with designing the structure of discussion well in advance of the start of a course (Lee, 2012). A two-year study of students in over 50 online MBA programs found that the more active and engaging the instructor, the more they were perceived by

students as being effective (Arbaugh, 2013). Studies suggest high levels of participation, reflection, and frequency of interaction in online discussions and activities are critical to student academic success in online classes (Duncan, Kenworthy, & McNamara, 2012; Cacciamani et al, 2012, He, 2013).

The field of online education has been changing as rapidly as the technologies that it is built upon. Web 2.0 applications have increased the options that instructors can utilize when teaching students in online, hybrid, and traditional environments. Traditional approaches to college studies might make less sense when addressing the diverse needs and learning skills of the growing post-secondary institution population (Scott, McGuire, & Shaw, 2003; Edyburn, 2010). NCES reported nearly 11% of all students enrolled in universities have a disability (Knapp, Kelly-Reid, & Grinder, 2010). With this growing and diverse population, it is important to design courses with accessibility in mind. This will reduce the need to retrofit necessary accommodations, and increase students' motivation to learn (Poore-Pariseau, 2010; Edyburn, 2010). By utilizing technologies that students are already using today (i.e. blogs, streaming video, social networking), instructors can continue to diversify teaching experiences and increase student accessibility to learning materials (Grabinger, Applin, & Ponnappa-Brenner, 2008; Embry, Parker, McGuire, & Scott, 2005). This ties directly into the principles of UDL—by incorporating these newer technologies, instructors are providing multiple means of conveyance, and likewise granting students new and creative ways to participate in their coursework.

Universal Design for Learning

UDL is an important set of guidelines that allows all students to access learning based on their needs and interests (CAST, 2008). Its main goal is to help educators address the variability in students' capacities to learn, including those with learning disabilities as well as those with academic proficiencies (Mangiatordi & Serenelli, 2013). UDL is defined as a scientifically valid framework for guiding educational practice that 1) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and 2) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students (NCUDL, 2013).

UDL is based on research in neuroscience, specifically on the three main neural networks that are involved in the variability of an individual's learning process: 1) recognition networks (fact gathering and categorizing what we see, hear, and read); 2) strategic networks (organizing and expressing our ideas); and 3) affective networks (connecting the learning experience to an emotional background, determining engagement and motivation) (Meyer, Rose, & Gordon, 2014; Rose & Meyer, 2002; Edyburn, 2009). To address student needs, three principles were created: provide multiple means of representation, provide multiple means of action and expression, and provide multiple means of engagement (Meyer, Rose, & Gordon, 2014; Rose & Meyer, 2002; Edyburn, 2009). Table 1 provides a description of the three principles of UDL and the guidelines that accompany each principle.

Educational technology provides teachers with a convenient way to address the three UDL principles (Edyburn, 2010). UDL embraces the diversity in all learners and their needs, leading educators to diverge from the traditional classroom format in higher education and adapt an inclusive curriculum by providing multiple means of representation. UDL is so intrinsically tied to technology that "to suggest the potential of UDL can be achieved without technology is simply another way to maintain the status quo" (Edyburn, 2010, p. 38). With its deep scientific infrastructure and intrinsic link to technology, UDL is a strong tool to develop online coursework for post-secondary students.

Table 1 *UDL Principles Overview*

I. Provide Multiple Means of Representation	1. Provide Options for Perception •Options that customize the display of information •Options that provide alternatives for auditory and visual information	2. Provide Options for Language & Symbols •Options that define the vocabulary and symbols •Options that illustrate key concepts non-linguistically	3. Provide Options for Comprehension •Options that highlight critical features, ideas, and relationships •Options that support memory and transfer
II. Provide Multiple Means of Action & Expression	4. Provide Options for Physical Action •Options for accessing tools & assistive technologies •Options in the means of navigation •Options in the mode of physical responses	5. Provide Options for Expressive Skills & Fluency •Options in media for communication •Options in tools for composition & problem solving •Options in the scaffolds for practice & performance	6. Provide Options for Executive Functions •Options that guide goal-setting •Options that support planning & strategy development •Options that enhance capacity for monitoring progress
III. Provide Multiple Means of Engagement	7. Provide Options for Recruiting Interest •Options that increase individual choice, &autonomy •Options that enhance relevance, value, & authenticit	8. Provide Options for Sustaining Effort & Persistence •Options that vary levels of challenge & support •Options that foster collaboration & communication	9. Provide Options for Self-Regulation •Options to guide personal goal-setting & expectations •Options that develop self-assessment & reflections

Adapted from Center for Applied Special Technology, 2011.

UDL in College Coursework

The accessibility of web 2.0 tools and the availability of digital texts has paved the way for a significant increase in UDL implementation within the post-secondary education environment (Gradel & Edson, 2009). Several studies have discussed how the utilization of the Blackboard online platform "expanded the flexibility of classroom presentations," and allowed professors to "re-evaluate and shift instruction" when needed (Pace & Schwartz, 2008; Gradel & Edson, 2009). This does not mean UDL is limited to online instruction. UDL principles can be met in traditional classroom settings by using PowerPoint presentations with printouts of slides, videos with subtitles, or classroom transcripts (Rose, Meyer, & Hitchcock, 2005). Course websites made available online can enhance the classroom experience by allowing students asynchronous access to materials at any time and anywhere as long as they have an internet connection. While the implementation of UDL does not rely solely on technology, it

is a useful medium for maximizing student access for instructors designing their courses with web accessibility in mind (Izzo, Murray, & Novak, 2008).

Despite the fact that UDL can be a strong tool in coursework design, there are few studies which have examined the specific use of UDL principles in post-secondary environments, and fewer studies which have characterized by true experimental designs. Engleman and Schmidt published one of the earliest reports about testing an experimental UDL unit in a graduate-level online teacher education course (2007). One of the goals of the course was to teach graduate students to use UDL with their students, and the course itself was designed using the same UDL principles. After completing the course, students participated in a survey with four questions pertaining to UDL; per each question, students responded positively. Out of 138 participants, 133 felt the choices had distinct differences, 107 preferred having choices every week, 115 reported having more confidence to succeed in the course, and 113 reported that the amount of choices allowed them more opportunities to challenge themselves (Engleman & Schmidt, 2007). The authors did address two noticeable shortcomings in this design. First, the sample size was too small to generalize beyond the study's population. Also, more specific preference questions should have been asked in the UDL unit (Engleman & Schmidt, 2007).

Spooner, Baker, Harris, Ahlgrim-Delzell, and Browder (2007) conducted an experiment on the effects of UDL training on lesson plan development in participants from four different on-campus education classrooms, with participants studying in both general and special education fields. Students were randomly assigned to one of either two experimental or two control groups. Each group took a pre-test on lesson planning. The experimental groups (one for the general education class, and one for the special education class) had a special one-hour seminar discussing the principles and implementation of UDL in classroom curricula. Results showed that participants in the experimental group improved their lesson plan development significantly after the one-hour intervention compared to the control group. These results suggest that even a simple introduction to UDL can help up-and-coming teachers design lesson plans accessible for all students (Spooner et al, 2007). This study had a few limitations as well. Once again, the low sample size made it difficult to generalize to the entire population. A longitudinal study would be beneficial to determine if teachers continued to use UDL principles when designing their coursework (Spooner et al, 2007). Perhaps the most notable absence, whether by omission or by design, is the fact that there is no mention as to whether or not the college courses themselves were designed with UDL outside of the one-hour seminar. This, too, would affect students' development, and would make for a more compelling argument to use UDL in college coursework in the future.

Morra and Reynolds (2010) wrote an editorial regarding their work on transforming two traditional courses to online classrooms designed utilizing UDL principles. The authors noted that "…specific care was used to take advantage of the online platform in which assignments were delivered" (Morra & Reynolds, 2010). Assignments were developed with the three principles of UDL in mind; resources were provided with multiple internet-based and highly interactive activities for students to complete the assignment; learners were given choices between multiple ways to complete assessments used towards their final grade, which in turn gave the students motivation to complete their assignments (Morra & Reynolds, 2010). What Morra and Reynolds provide in their work is a guide on how they planned the courses with each principle in mind; what is not provided is any data regarding how the design affected the academic abilities or content mastery of the students. It would have been beneficial to know how the students felt about the course compared to other courses they have taken (both online and traditional). A post-course survey seeing if the courses really were representative of UDL in their design would also have been useful. Similarly, Rao and Tanners (2011) created an online course designed with UDL and Universal Design for Instruction (UDI) principles in mind in relation to four core areas: course materials, instructional strategies, asynchronous technologies, and synchronous technologies. At the end of the course, all 25 participants completed a questionnaire specifically designed to collect information on their perceptions of the UDL features of the course. Students reported appreciating the choices provided

by several course elements, including multiple formats for materials; the brief, weekly assignments that were less stressful than high-stakes assessments; and the level of interaction between the instructor and the class, wishing other online course instructors had such dedication (Rao & Tanners, 2011). This study was short-term (one class in one semester) and looked at a small population of students (n=25). Rao & Tanner (2011) conceded that this was "the initial phase of research," (p.226) requiring the collection of data from future UDL-designed courses to build a larger sample size. They also expressed a desire to survey whether or not the course elements are useful to students with disabilities (Rao & Tanners, 2011).

Smith (2012) tried to develop an instructional checklist, paired with an end-of-semester survey to determine if the principles of UDL were represented in the traditional class itself. The course template was designed to match the course objectives with tasks designed around the recognition, strategic, and affective learning networks, and the follow-up survey determined which of the strategies were used by the students. Responses were favorable towards the implementation of UDL instructional practices, and suggest that when UDL is used to help design courses, the goals are more clearly aligned with the instructional practices (Smith, 2012). It is important to note that at the time of this survey's development, the nine guidelines of UDL curriculum development were not yet published, and a future study examining student perception of the application of these guidelines in a UDL-designed course would be beneficial.

From these previous works, the authors of this study determined a direction for our research. The utilization of UDL in college coursework is still a field of study filled with potential. Colleges are at the beginning stages of developing courses utilizing the UDL principles. With the newer, nine-point guidelines based on these three principles having only recently been developed, courses designed with these in mind need to be evaluated. The authors of this study have developed three online graduate level courses utilizing the nine-point guidelines based the three UDL principles. The purpose of this initial study is to examine whether the online graduate-level course designs are aligned with the UDL principles and whether teachers perceive that the course design improved their preparation.

Methodology

Purpose of the Study

The purpose of this initial study was to examine whether three online courses in a graduate-level program are aligned with the UDL principles, and whether teachers enrolled in the online courses perceive that the course design helped to improve their preparation. The authors believe quality online teacher preparation programs can exist, and that the UDL framework can be used to enhance the quality of coursework and preparation of teachers. But can online courses in teacher preparation programs be designed using the UDL guidelines? If so, do teachers believe online courses designed using the UDL principles can help to improve their preparation for the classroom? The authors developed an initial descriptive survey study directed at answering these questions. Descriptive survey studies are used to describe a one-time interaction with groups of people at one point in time, and are often described as the best method for collecting research data prior to performing an experimental study (Jackson, 2009). By obtaining this information, the authors believe that stakeholders can make decisions about online teacher preparation courses and programs in the future.

Procedures

During the Spring 2014 semester, three online graduate-level courses in the university's special education master's program were designed as online courses using the UDL Guidelines (CAST, 2011). The university is a public university in the Mid-Atlantic region of the United States. Table 2 is an example of how the UDL principles and guidelines (see Table 1) were used to support the development of the online courses. The table also includes examples of assignments and interactions that were developed

within the online courses. This included full integration of UDL principles, current technology, and development of collaborative teaching skills.

Table 2 *Online Course Design with UDL*

I. Provide Multiple Means of Representation	1. Provide Options for Perception •Options that customize the display of information •Options that provide alternatives for auditory and visual information *Example*: Video/audio and slide presentations that the professor shows and that the students develop include transcripts for diverse learners and reinforce UDL concepts	2. Provide Options for Language & Symbols •Options that define the vocabulary and symbols •Options that illustrate key concepts non-linguistically *Example*: To introduce students to new technologies over the course of the semester, every assignment can be completed using a different type of tool (ex. Voki, vlogs, audio recordings) to narrate & explain graphical concepts	3. Provide Options for Comprehension •Options that highlight critical features, ideas, and relationships •Options that support memory and transfer *Example*: Instructors highlight key elements using text, graphics, and diagrams, while providing a brief checklist of core concepts on the side of the website via navigation bar
II. Provide Multiple Means of Action & Expression	4. Provide Options for Physical Action •Options for accessing tools & assistive technologies •Options in the means of navigation •Options in the mode of physical responses *Example*: Courses utilize Google Sites as a framework by which we provide information and literature that is accessible via multiple technological and physical mediums (assigned textbooks, PDF files, and websites that can be accessed via traditional and technological means)	5. Provide Options for Expressive Skills & Fluency •Options in media for communication •Options in tools for composition & problem solving •Options in the scaffolds for practice & performance *Example*: Discussion assignments task students with the opportunity to choose what kind of presentation (Powerpoint, Voki, oral report, etc.) to demonstrate mastery of materials, share it within the discussion boards, and challenge other students with questions they have developed	6. Provide Options for Executive Functions •Options that guide goal-setting •Options that support planning & strategy development •Options that enhance capacity for monitoring progress *Example*: In addition to the discussion boards, additional boards are set up for in-class groups to engage in discussions with each other regarding assignments, as well as a space for the entire class to get feedback from the professor and teaching assistant(s)

		based on their understanding of the material	
III. Provide Multiple Means of Engagement	7. Provide Options for Recruiting Interest •Options that increase individual choice, &autonomy •Options that enhance relevance, value, & authenticity *Example*: Students will write a case position paper regarding a court case on a topic (ex. LRE, evaluation, eligibility) that describes the facts, issues, and findings of the order; students themselves get to choose both the topic and a case that interests them	8. Provide Options for Sustaining Effort & Persistence •Options that vary levels of challenge & support •Options that foster collaboration & communication *Example*: Working together in groups of 2-3, students will develop a team teaching lesson plan for a grade 6-12 class utilizing UDL techniques. Students will also collaborate to create a brief visual presentation that also meet UDL standards	9. Provide Options for Self-Regulation •Options to guide personal goal-setting & expectations •Options that develop self-assessment & reflections *Example*: Each site has a section devoted to grading expectations, evaluation, & assessment, where students can see the point values and determine the expectations of the course. Students are also encouraged to reflect on the materials via weekly discussions

Instrumentation

During the Spring 2014 semester, three online graduate-level courses in the university's special education master's program were designed using the UDL Guidelines (CAST, 2011). An online survey was developed independently by the authors based on a review of the literature, the UDL Guidelines (CAST, 2011), and the online courses. The survey contained demographics such as age, ethnicity, gender, and reason for enrolling in the online graduate-level course(s). The survey was presented to faculty with expertise in UDL and pre-service and in-service teachers in one of the author's graduate level class for feedback (N=15). The authors made revisions and eliminated any questions where negative feedback was provided. The final survey contained a total of 32 questions. However for the purpose of this study, a total of 20 quantitative Likert-type questions were used to gather details on participants' perceptions on the course's alignment to UDL guidelines (Appendix A). The scales within each rating varied from 1 to 5, with lower scores indicating disagreement with the statement and higher scores indicating agreement. The survey was sent via email during the first week in July 2014 using Research Electronic Data Capture (REDCap), the university's online survey system. The authors also sent a follow-up email after approximately one week, and again one week after the courses ended.

Participants

At the time of this study there were a total of 55 students enrolled across the three online-graduate level courses. The final sample consisted of 37 participants (n=20 pre-service teachers; n=17 in-service teachers), representing an estimated 67% response rate. While this participant rate is relatively small—and this is a limitation of the study—the authors will seek a larger sample once more courses are

redesigned using the UDL principles and student enrollment increases. The majority of participants reported they were taking the course to satisfy degree requirements (*n*=28), were female (*n*=33), were between the ages 20-30 (*n*=18), and were Caucasian/White (*n*=28). A vast majority of participants (*n*=30) indicated they have taken an online course before. Finally, the sample varied greatly in how experienced they were with online courses: very experienced (*n*=7); somewhat experienced (*n*=15); casually experienced (*n*=5); somewhat inexperienced (*n*=2); and very inexperienced (*n*=5).

Data Analysis

The results of the survey were analyzed using Excel. Descriptive statistics were calculated for each item in Excel, and the raw scores of survey respondents are reported.
The survey was scored by averaging the response to each of the individual survey questions. The scales within each ratings varied from 1 to 5, with lower scores indicating that the participant "disagreed" with the statement and higher scores indicated an "agreement" with the survey statement. Descriptive statistics (i.e., mean, standard deviation) are reported (see Tables 3, 4, and 5) below.

Results

Table 3 depicts the means and standard deviation results of participants reported perceptions regarding the alignment of the online graduate course to the UDL principle for Multiple Means of Representation (MMR). Participants also reported whether they perceived that their learning and preparation was positively impacted as a result of the course alignment with MMR. Overall, Table 3 shows that the participants reported higher mean scores regularly across this UDL principle.

Table 3 *Multiple Means of Representation (n=37)*

Course Template	Mean	Standard Deviation
Content provided in multiple, adjustable formats	4.78	.480
Information presented in multiple ways	4.81	.397
Assignments provided in multiple formats	4.72	.560
Learning/Preparation was positively impacted	4.62	.545

Table 4 depicts the means and standard deviation results of participants' reported perceptions regarding the alignment of the online graduate course to the UDL principle for Multiple Means of Expression (MME). Participants also reported whether they perceived that their learning and preparation was positively impacted as a result of the course alignment with MME. Overall, Table 4 shows that the participants reported higher mean scores regularly across this UDL principle.

Table 4 *Multiple Means of Expression (n=37)*

Course Template	Mean	Standard Deviation
Multiple ways to complete tasks	4.59	.600
Multiple ways to express knowledge	4.83	.443
Use of technology to express knowledge	4.81	.401
Learning/Preparation was positively impacted	4.72	.454

Table 5 depicts the means and standard deviation results of participants reported perceptions regarding the alignment of the online graduate course to the UDL principle for Multiple Means of

Engagement (MMEg). Participants also reported whether they perceived that their learning and preparation was positively impacted as a result of the course alignment with MMEg. As with the two previous principles, Table 5 shows that the participants reported higher mean scores.

Table 5 *Multiple Means of Engagement (n=37)*

Course Template	Mean	Standard Deviation
Material relevant and valuable	4.64	.544
Motivation to learn about subject	4.03	.835
Website engaged in learning	4.32	.973
Multiple instructional methods for involvement	3.97	0.14
Learning/Preparation was positively impacted	4.57	.603

Discussion

In reporting the results of the previous section, we detailed the UDL principles (i.e., multiple means of representation, expression, and engagement) and investigated whether three online courses were aligned with each UDL principle. The authors also sought to gather teachers' perceptions of their learning and preparation while enrolled in the online courses designed using the UDL principles. In this section we discuss what has been learned about integrating UDL into the online courses. As we indicated in our review, UDL may offer ways to enhance the coursework and preparation of students enrolled in online programs. What materialized from this descriptive study was that teachers' insights into the UDL principles— including the multiple ways in which information and material were presented in the courses—were positively impacted. The findings revealed a consensus across participants with respect to whether the online graduate courses aligned with the UDL principles. Specifically, participants rated highly each of the UDL guidelines embedded in the course, with "multiple instructional methods for involvement" having the "lowest" overall rating at a very respectable (M = 3.97). We believe that the findings may suggest that the utilization of the UDL principles in online college coursework is promising, and that participants strongly agree having UDL principles infused into online courses may positively impact their learning and preparation.

Limitations

This study's generalizability is limited by its nature as it is a study focused on one university's program—e.g., the limited sample size, the typical limitations associated with methodologies relying on surveys to collect information, etc. (Visser, Krosnick, & Lavrakas, 2000). As mentioned above, the number of completed surveys was limited due to the program's population; therefore future studies on this topic will warrant larger samples and higher response completion rates. As well, this study relies on participants' self-reported data. The current data do not report on the quality of their preparation as teachers. Self-reported data is normally determined by how well participants understand the question and their honest depiction of how well they interpret what they are doing and to what degree it is working (Carducci, 2009). The authors of this study attempted to minimize any limitations with this study by conducting a pilot study of the survey and receiving advice about wording and clarity regarding the survey questions. The authors made revisions and eliminated any questions where negative commentary was provided. Because there has been limited research in the area of UDL in college coursework, we believe that the findings reported are of value to the literature on online coursework and UDL. Last, participants were not asked to justify their response to the questions. It would have been valuable to ask participants to justify their ratings in order to get a better understanding of participants' perceptions regarding what components of the course aligned with each UDL principle and why they believe that learning and preparation was improved.

Implications for Future Research

In future research, an attempt should be made to increase the number of courses that embed UDL principles and reach out to other universities and programs that follow a similar approach; this will increase the participant pool and provide an opportunity to collect information and data from a variety of educational stakeholders. While the findings of this study confirm course alignment with UDL principles, as collected by the quantitative data, future studies may seek to gather both qualitative and quantitative data in order to gain a more rich, descriptive understanding of participants' perception of UDL alignment and preparation. Limited empirical research currently exists that has evaluated online course delivery methods (Vernon-Dotson, Floyd, Dukes, & Darling, 2014), and even less that has examined the use of UDL in college coursework. Experimental designs that focus on this topic may indeed be warranted.

Future qualitative, mixed-method, and or experimental design studies may address some of the following questions: How do educators at the college level benefit from UDL embedded in online coursework? What type(s) of training do faculty and university stakeholders require to align online courses with the UDL principles? How does educator preparation improve as a result of UDL in online coursework (e.g., grades, retention rate, graduation rates) (Roberts, Park, Brown, & Cook, 2011)? Are students of educators who have taken online coursework utilizing UDL principles better prepared? Does a UDL approach in online coursework for special education teachers improve outcomes for students with disabilities?

UDL offers a relatively large number of guidelines to follow. Besides knowing whether courses suggesting they are utilizing UDL principles are truly aligned, it will be important for future research to investigate what options and resources are being utilized to determine whether the desired results can be accomplished. For example, do all online courses utilizing UDL have to follow the same standardization of technology tools and resources in order to be effective?

Implication for Future Practice

Despite the limitations of this study, there are certain conclusions that can be drawn from the findings. First, a rationale for the UDL framework in online college courses can be made because of its connection with educational technology (Edyburn, 2010). Second, the ability to embed UDL principles in online coursework is presented. Finally, it is apparent that participants perceive that their overall learning and preparation was improved as a result of being enrolled in the course(s) featuring UDL. Despite the fact that there might exist a discrepancy between perception and performance related to learning and preparation, particularly because there was no opportunity in the survey for an examination of participants actual learning and preparation, it may be that participants rated this category as high because they already do well with these skills. In this case, there would be no need to change current practice although research suggests that even a simple introduction to UDL can help up-and-coming teachers design lesson plans accessible for all students (Spooner et al, 2007).

The list of UDL guidelines and examples presented in this study are not extensive (see Table 1). They can be used by faculty at post-secondary education institutions as a starting point for assessing and aligning online college courses to UDL practices. While the UDL principles identified in this study were validated by participants as being aligned with the online courses, the options and examples of how they were presented in the courses can be taught and practiced in multiple ways that can help to enhance how UDL is embedded in online courses. Overall, we are encouraged by the participants' recognition of the UDL principles alignment and their perceived positive preparation as a result of being enrolled in the course(s). We believe that a failure to collect this data may threaten the quality learning experience that is the goal of our work in the online learning community.

References

Allen, I. E., & Seaman, J. (2003). *Sizing the opportunity: the quality and extent of online education in the United States, 2002 and 2003*. Needham, MA: The Sloan Consortium.

Allen, I. E., & Seaman, J. (2011). *Going the distance: online education in the United States, 2011*. Babson Park, MA: Babson Survey Research Group.

Allen, I. E., & Seaman, J. (2014). *Grade change: tracking online education in the United States, 2013*. Babson Park, MA: Babson Survey Research Group and Quahog Research Group.

Andresen, B. B. (2002). Design of teacher e-learning. In D. Passey & M. Kendall (Eds.), *TelE-Learning: the challenge for the third millennium* (pp. 3-10) New York: Springer Science+Business Media.

Arbaugh, J. B. (2013). Does academic discipline moderate CoI-course outcomes relationships in online MBA courses? *The Internet and Higher Education*, *17*, 16-28.

Bambara, C. S., Harbour, C. P., Davies, T. G., & Athey, S. (2009). Delicate engagement: the lived experience of community college students enrolled in high-risk online courses. *Community College Review*, *36*(3), 219–238.

Cacciamani, S., Cesareni, D., Martini, F., Ferrini, T., & Fujita, N. (2012). Influence of participation, facilitator styles, and metacognitive reflection on knowledge building in online university courses. *Computers & Education*, *58*(3), 874-884.

Carducci, B. J. (2009). *The psychology of personality: viewpoints, research, and applications*. Malden, MA: Wiley-Blackwell.

CAST, (2008). *Universal Design for Learning guidelines version 1.0*. Wakefield, MA: Author

CAST (2011). *Universal Design for Learning guidelines version 2.0.* Wakefield, MA: Author.

Clay, C. (2012).*Great webinars: create interactive learning that is captivating, informative, and fun*. San Francisco: John Wiley & Sons.

Columbaro, C. H., & Monaghan, N. L. (2009). Employer perceptions of online degrees: a literature review. *Online Journal of Distance Learning Administration*, *12*(1). Retrieved from http://www.westga.edu/~distance/ojdla/spring121/columbaro121.html

Cox, R. (2005). Online education as institutional myth: rituals and realities at community colleges. *The Teachers College Record*, *107*(8), 1754-1787.

Duncan, K., Kenworthy, A., & McNamara, R. (2012). The effect of synchronous and participation on students' performance in online accounting courses. *Accounting Education*, *21*(4), 431-449.

Edyburn, D. (2009). RTI and UDL interventions. *Journal of Special Education Technology*, *24*(2), 46-47.

Edyburn, D. L. (2010). Would you recognize universal design for learning if you saw it? Ten propositions for new directions for the second decade of UDL. *Learning Disability Quarterly*, *33*(1), 33-41.

Embry, P. B., Parker, D. R., McGuire, J. M., & Scott, S. S. (2005). Postsecondary disability service providers' perceptions about implementing Universal Design for Instruction (UDI). *Journal of Postsecondary Education and Disability*, *18*(1), 34-48.

Engleman, M., & Schmidt, M. (2007). Testing an experimental universally designed learning unit in a graduate level online teacher education course. *Journal of Online Learning and Teaching*, *3*(2), 112-132.

Gargiulo, R., & Kilgo, J. (2013). *An introduction to young children with special needs: birth through age eight*. Belmont, CA: Cengage Learning.

Grabinger, R. S., Aplin, C., & Ponnappa-Brenner, G. (2008). Supporting learners with cognitive impairments in online environments. *TechTrends*, *52*(1), 63-69.

Gradel, K., & Edson, A. J. (2009). Putting universal design for learning on the higher ed agenda. *Journal of Educational Technology Systems*, *38*(2), 111-121.

He, W. (2013). Examining students' online interaction in a live video streaming environment using data mining and text mining. *Computers in Human Behavior*, *29*(1), 90-102.

Herman, T., & Banister, S. (2007). Face-to-face versus online coursework: a comparison of learning outcomes and costs. *Contemporary Issues in Technology and Teacher Education*, *7*(4), 318-326.

Hutchison, L. F. (2012). Addressing the STEM teacher shortage in American schools: ways to recruit and retain effective STEM teachers. *Action in Teacher Education*, *34*, 541-550. http://dx.doi.org/10.1080/01626620.2012.729483

Izzo, M. V., Murray, A., & Novak, J. (2008). The faculty perspective on Universal Design for Learning. *Journal of Postsecondary Education and Disability*, *21*(2), 60-72.

Jackson S.L. (2009). *Research methods and statistics: a critical thinking approach* (3rd ed.). Belmont, CA: Wadsworth.

Jiménez, T. C., Graf, V. L., & Rose, E. (2007). Gaining access to general education: the promise of Universal Design for Learning. *Issues in Teacher Education*, *16*(2), 41-54.

Kennedy, B. H. (2013). *A qualitative case study of the bilingual teacher shortage in one Texas school district* (Doctoral dissertation). Available from ProQuest. (UMI No. 3606445)

Knapp, L., Kelly-Reid, J., & Ginder, S. (2010). *Enrollment in postsecondary institutions, fall 2008; graduation rates, 2002 & 2005 cohorts; and financial statistics, fiscal year 2008* (NCES 2010-152). Washington, DC: National Center for Education Statistics.

Lee, C. Y., Dickerson, J., & Winslow, J. (2012). An analysis of organizational approaches to online course structures. *Online Journal of Distance Learning Administration*, *15*(1).

Mangiatordi, A., & Serenelli, F. (2013). Universal Design for Learning: a meta-analytic review of 80 abstracts from peer reviewed journals. *REM*, *5*(1), 109-118.

Mcguire, J. M., Scott, S. S., & Shaw, S. F. (2006). Universal design and its applications in educational environments. *Remedial and special education*, *27*(3), 166-175.

Mebane, M., Porcelli, R., Iannone, A., Attanasio, C., & Francescato, D. (2008). Evaluation of the efficacy of affective education online training in promoting academic and professional learning and social capital. *International Journal of Human–Computer Interaction*, *24*(1), 68-86.

Meo, G. (2008). Curriculum planning for all learners: applying Universal Design for Learning (UDL) to a high school reading comprehension program. *Preventing School Failure: Alternative Education for Children and Youth*, *52*(2), 21-30.

Meyer, A, Rose, D. H. R., & Gordon, D. (2014). *Universal design for learning: theory and practice*. Wakefield, MA: CAST Professional Publishing.

Morra, T., & Reynolds, J. (2010). Universal Design for Learning: application for technology-enhanced learning. *Inquiry*, *15*(1), 43-51.

National Center for Education Statistics. (2014). Web tables: enrollment in distance education courses, by state: Fall 2012. US Department of Education. [NCES 2014-023]. http://nces.ed.gov/pubs2014/2014023.pdf.

NCUDL (2013). How has UDL been defined? National Center On Universal Design for Learning website. Retrieved from http://www.udlcenter.org/aboutudl/udldefined

Pace, D., & Schwartz, D. (2008). Accessibility in post secondary education: application of UDL to college curriculum. *US-China Education Review*, *5*(12), 20-26.

Poore-Pariseau, C. (2010). Online learning: designing for all users. *Journal of Usability studies*, *5*(4), 147-156.

Powell, R. G., & Powell, D. (2010). *Classroom communication and diversity: enhancing instructional practice*. New York: Routledge.

Rao, K., & Tanners, A. (2011). Curb cuts in cyberspace: Universal Instructional Design for online courses. *Journal of Postsecondary Education and Disability*, *24*(3), 211-229.

Roberts, K. D., Park, H. J., Brown, S., & Cook, B. (2011). Universal Design for Instruction in postsecondary education: a systematic review of empirically based articles. *Journal of Postsecondary Education and Disability*, *24*(1), 5-15.

Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal Design for Learning. Association for Supervision and Curriculum Development*. Alexandria, VA: Association for Supervision & Curriculum Development.

Rose, D., Meyer, A., & Hitchcock, C. (2005). *The universally designed classroom: accessible curriculum and digital technologies*. Cambridge, MA: Harvard University Press

Scott, S., McGuire, J., & Shaw, S. (2003). Universal design for instruction: a new paradigm for teaching adults in postsecondary education. *Remedial and Special Education*, *24*(6), 369-379.

Smith, F. G. (2012). Analyzing a college course that adheres to the Universal Design for Learning (UDL) framework. *Journal of the Scholarship of Teaching and Learning*, *12*(3), 31-61.

Smith, T.E.C., Polloway, E.A., Patton, J.R., & Dowdy, C.A. (2001). *Teaching students with special needs in inclusive settings*, (3rd ed.). Boston: Allyn & Bacon.

Spooner, F., Baker, J. N., Harris, A. A., Ahlgrim-Delzell, L., & Browder, D. M. (2007). Effects of training in universal design for learning on lesson plan development. *Remedial and Special Education*, *28*(2), 108-116.

Tanner, J. R., Noser, T. C., & Totaro, M. W. (2009). Business faculty and undergraduate students' perceptions of online learning: a comparative study. *Journal of Information Systems Education*, *20*(1), 29.

Tayebinik, M., & Puteh, M. (2013). Does greater participation in online courses lead to passing grade? An EFL learning context. *British Journal of Educational Technology*, *44*(6), E199-E202.

Taylor, P., & Maor, D. (2000). Assessing the efficacy of online teaching with the Constructivist Online Learning Environment Survey. In A. Herrmann and M.M. Kulski (Eds), *Flexible Futures in Tertiary Teaching. Proceedings of the 9th Annual Teaching Learning Forum*. Perth: Curtin University of Technology.

Thornton, B., Peltier, G., & Medina, R. (2007). Reducing the special education teacher shortage. *The Clearing House*, *80*(5), 233-238.

U.S. Department of Education, Office of Postsecondary Education. (2011). *Preparing and credentialing the nation's teachers: the Secretary's eighth report on teacher quality; based on data provided for 2008, 2009 and 2010*, Washington, D.C.

Vernon-Dotson, L. J., Floyd, L. O., Dukes, C., & Darling, S. M. (2014). Course delivery: keystones of effective special education teacher preparation. *Teacher Education and Special Education, 37,* 34-50. doi: 10.1177/0888406413507728

Visser, P. S., Krosnick, J. A., & Lavrakas, P. J. (2000). Survey research. In H. T. Reis & C. M. Judd (Ed.), *Handbook of research methods in social psychology* (pp. 223–252). New York, NY: Cambridge University Press.

Xu, D., & Jaggars, S. S. (2011). The effectiveness of distance education across Virginia's community colleges: evidence from introductory college-level math and English courses. *Educational Evaluation and Policy Analysis*, *33*(3), 360-377.

Appendix A: Online Course and UDL Survey

Which of the following best describes your reason for taking the course?

- ○ Degree Requirement
- ○ Elective Course
- ○ Professional Development
- ○ Other

What gender do you identify with?

- ○ Male
- ○ Female

What is your age?

- ○ <20 Years
- ○ 20-30 Years
- ○ 30-40 Years
- ○ 40-50 Years
- ○ 50+ Years

I accessed the course website with the following tools:

- ☐ Computer (Desktop, laptop, Mac or PC)
- ☐ Mobile Phone
- ☐ Tablet
- ☐ Internet-enabled Television
- ☐ Other: _____

What is your race/ethnicity?

- ○ African-American
- ○ Asian/Pacific Islander
- ○ Hispanic/Latino
- ○ Caucasian/White
- ○ Other: _____

Have you taken an online course before?

- ○ Yes
- ○ No

How experienced are you with online courses?

- Very experienced
- Somewhat experienced
- Casually experienced
- Somewhat inexperienced
- Very inexperienced

Rate your agreement with the following phrase: The learning objectives for this course were clear.

- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

Rate your agreement with the following phrase: The course website was easy to use.

- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

Rate your agreement with the following phrase: The course website is a good platform to showcase my learning.

- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

How easily were you able to find information on the website? It was easy to find the information I needed on the course website?

- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

- Rate your agreement with the following phrase: I was able to interact with peers using the course website.
- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

Rate your agreement with the following phrase: I was able to interact with my instructor using the course website.

- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

Rate your agreement with the following phrase: The layout of the course website was well-organized.

- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

Rate your agreement with the following phrase: Resources used were helpful in completing this course.

- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

Rate your agreement with the following phrase: I would take another course using this course website design.

- Completely agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Completely disagree

Rate your agreement with the following phrase: This course provided content in multiple, adjustable formats (text, video, audio, etc).

- Completely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Rate your agreement with the following phrase: Information in this course was presented to me in multiple ways (video, audio, text, etc).

- Completely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Rate your agreement with the following phrase: Assignments or activities in this course were provided in multiple formats.

- Completely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Absolutely Disagree

Rate your agreement with the following phrase: My learning/preparation was positively impacted as a result of the content being presented in multiple ways.

- Completely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Absolutely Disagree

Rate your agreement with the following phrase: The course offered multiple ways to complete tasks.

- Absolutely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Absolutely Disagree

Rate your agreement with the following phrase: This course allowed for multiple ways to express or communicate my knowledge.

- Absolutely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Absolutely Disagree

Rate your agreement with the following phrase: The course encouraged the use of technology to express my knowledge.

- Absolutely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Absolutely Disagree

Rate your agreement with the following phrase: My learning/preparation was positively impacted as a result of having multiple ways to express or communicate my knowledge.

- Absolutely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Absolutely Disagree

Rate your agreement with the following phrase: The course material was relevant and had value.

- Completely agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Rate your agreement with the following phrase: This course was a motivation to learn more about the subject matter.

- Completely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Rate your agreement with the following phrase: This course website offered opportunities to become engaged in learning.

- Completely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Rate your agreement with the following phrase: This course offered multiple instructional methods that allowed me to become involved in the learning process.

- Completely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

Rate your agreement with the following phrase: My learning/preparation was positively impacted as a result of becoming engaged in the learning process.

- Completely Agree
- Agree
- Neither agree nor disagree
- Disagree
- Completely Disagree

An Exploratory Factor Analysis and Reliability Analysis of the Student Online Learning Readiness (SOLR) Instrument

Taeho Yu
University of Virginia

Jennifer C. Richardson
Purdue University

Abstract

The purpose of this study was to develop an effective instrument to measure student readiness in online learning with reliable predictors of online learning success factors such as learning outcomes and learner satisfaction. The validity and reliability of the Student Online Learning Readiness (SOLR) instrument were tested using exploratory factor analysis (EFA) and reliability analysis. Twenty items from three competencies—social competencies, communication competencies, and technical competencies—were designated for the initial instrument based on the Student Online Learning Readiness (SOLR) Model as a new conceptual model. An exploratory factor analysis (EFA) revealed that four factor-structures of the instrument of student readiness in online learning explained 66.69% of the variance in the pattern of relationships among the items. All four factors had high reliabilities (all at or above Cronbach's $\alpha > .823$). Twenty items remained in the final questionnaire after deleting two items which cross-loaded on multiple factors (social competencies with classmates: five items; social competencies with instructor: five items; communication competencies: four items; and technical competencies: six items). The four-factor structure of the Student Online Learning Readiness (SOLR) instrument has been confirmed through this study. Educators can use the Student Online Learning Readiness (SOLR) instrument in order to gain a better understanding of the level of freshmen college students' online learning readiness by measuring their social, communication, and technical competencies. In addition, this study examined two factors of social integration in Tinto's Student Integration Model (SIM) and has introduced the Student Online Learning Readiness (SOLR) conceptual model with the purpose of extending Tinto's social integration model to online learning environments.

Introduction

Online learning has become a large part of higher education (Anderson, 2014; Duck & Parente, 2014; Kim, 2011). As of fall 2012, over 7.1 million U.S. college and university students had taken at least one online course (Allen & Seaman, 2014); more than 71% of US colleges and universities offered online courses (Allen & Seaman, 2013); and one-third of higher education students were enrolled in at least one online course during the calendar year (Allen & Seaman, 2014). According to the U.S. Department of Education's Distance Learning Report (Bakia, Shear, Toyama, & Lasserter, 2012), the benefits of online learning are: a) to broaden access to educational resources, b) to personalize learning, c) to provide flexibility in time and location for students, and d) to reduce school-based facilities' costs. However, the benefits of online learning also bring some challenges into the field of education.

First, retention rates in online learning courses are 10% to 25% less than those in traditional face-to-face formats in higher education (Ali & Leeds, 2009; Angelina, Williams, & Natvig, 2007; Holder, 2007; Lee & Choi, 2011; Poelhuber, Chomienne, & Karsenti, 2008). Second, students who take online courses for the first time tend to feel lonely and socially isolated not only because they are new to the online learning environment but also because they are not familiar with online learning communities (Cho, Shen, & Laffey, 2010; McInnerney & Roberts, 2004). This feeling of social isolation has a significant relationship with distance student attrition (Ali & Leeds, 2009; Link & Scholtz, 2000; Reio & Crim, 2006). Third, online learning requires learners to assume a greater responsibility for their studies and requires additional skills or competencies (Zawacki-Richter, 2004). For these reasons, it is important to offer distance learners additional forms of support in order to ensure successful online learning experiences (Watulak, 2012; Zawacki-Richter, 2004). In this manner, it becomes possible to improve student retention rates in online learning in higher education (Ali & Leeds, 2009; Atchley, Wingenbach, & Akers, 2012; Ludwig-Hardman & Dunlap, 2003; Moore & Kearsley, 2005).

Moreover, distance learners are more likely to have a lower sense of belonging than students in face-to-face formats (Ma & Yuen, 2010). According to Goodenow (1993), the concept of a "sense of belonging" at school refers to "the extent to which students feel personally accepted, respected, included, and supported by others in the school social environment" (p. 80), and the positive relationships including a sense of belonging, student motivation, and academic achievement were verified by a series of previous research (Battistich, Solomon, Watson, & Schaps, 1997; Flook, Repetti, & Ullman, 2005; Furrer & Skinner, 2003; Osterman, 2000; Tinto, 1975; Tinto, 1988; Tinto, 1993; Tinto, 1998). In line with the significance of a sense of belonging in an academic field, Tinto (1998) emphasized the positive effect of student-faculty interactions and student-student interactions on students' senses of belonging. In addition, technological elements, such as computer skills or Internet connections, are important success factors for online learning, including learning outcomes and learner satisfaction (Ben-Jacob, 2011; Herrera & Mendoza, 2011; Watulak, 2012). For this reason, it is necessary to provide support for distance learners in order to enhance their social competencies with instructors and classmates as well as their communication competencies and technical competencies so that they can have a better learning experience.

One preemptive way to accomplish this is by assisting students to more accurately gauge their readiness for online learning before they start a program. Distance learners should be provided with an opportunity to develop their competencies or readiness skills to better avoid a problematic situation involving non-content related learning challenges that could prevent success in online learning. For this reason, it is essential to both measure and enhance the learner's readiness for online learning before they take an online course. However, many educators in higher education do not know how to measure their learners' social, communication, and technical competencies which are required to succeed in such environments (Yu, 2014). Moreover, although a number of universities develop and implement their own online learning readiness surveys, these surveys—as discussed previously—tend to focus more on computer or Internet skills, technology accessibility, and general learner characteristics such as attitudes

toward online education or personal learning preferences (Bernard, Brauer, Abrami, & Surkes, 2004; Kerr, Rynearson, & Kerr, 2006; Watkins, Leigh, & Triner, 2004).

For these reasons, the purpose of this study is to develop a more specified instrument designed to measure student readiness in online learning through a focus on social, communication, and technical competencies. The development of a new instrument to measure distance learners' online learning readiness is significant for the future of the field of online learning and will provide useful and practical suggestions for administrators and educators in higher education as well as for the distance learners themselves. First, by using the existing literature related to a student's online learning readiness as a guide, a new instrument will be developed to measure the social, communication, and technical competencies of the varied learners within online learning environments. Second, the reliability and validity evidence of the developed instrument employed to measure social, communication, and technical competencies will be evaluated. The specific research questions addressed in this study are:

1. Which set of items should appropriately be included in the final instruments based on analyses of psychometric properties of the developed instrument that measures social competencies, communication competencies, and technical competencies?

2. What is the reliability and validity evidence of the developed instrument to measure social competencies, communication competencies, and technical competencies?

Literature Review

Previous research has supported the importance of measuring student readiness in online learning prior to students taking an online course (McVay, 2000, 2001; Parnell & Carraher, 2002; Smith, 2005; Watkins, Leigh, & Triner, 2004), as well as the significant impact of student readiness on student academic achievement within online learning environments (Bernard et al., 2004; Kerr et al., 2006). In addition, it is necessary to provide adequate social and academic support services in order to enhance students' senses of belonging in online learning both for increased meaningful learning experiences and higher retention rates (Ali & Leeds, 2009; Atchley, Wingenbach, & Akers, 2012; Ludwig-Hardman & Dunlap, 2003).

With respect to learner competencies, the terms "competency" and "competence" have been used as substitutes for one another in many studies. However, these two terms are slightly different from each other. The International Board of Standards for Training, Performance and Instruction (IBSTPI) defined competency as "a knowledge, skill, or attitude that enables one to effectively perform the activities of a given occupation or function the standards expected in employment" (Spector, 2001, p. 180). On the other hand, according to Kerka (1998), "competence is individualized, emphasizes outcomes (what individuals know and can do), and allows flexible pathways for achieving the outcomes—making as clear as possible what is to be achieved and the standards for measuring achievement" (p. 2). With the understanding of these terms, as so defined, the word "competency" will be used for the purpose of this study.

Competencies are an individual's perception of his or her ability or capability. For this study social competencies are defined as skills, competencies, and the feeling of control essential for managing social situations and building and maintaining relationships (Myllylä & Torp, 2010). Communication competencies are defined as "the ability to demonstrate knowledge of the socially appropriate communicative behavior in a given situation" (p. 24). Technical competencies are defined as "self-efficacy in technology" (Heo, 2011, p. 61).

The effect of learners' competencies on their academic achievement has been studied in the field of online education. First, the importance of social competencies for distance learners' academic

achievement has been supported (Chen et al., 2010; Parker et al., 2006; Williams, 2003). Cho and Jonassen (2009) found that there is a significant correlation between success in online learning environments and the student's social competencies in interacting with his or her instructor and peers in online courses. Second, a sizeable number of studies have proposed that interpersonal and communication competencies are the most influential predictors of academic achievement (Betermieux & Heuel, 2009; Dabbagh, 2007; Dabbagh & Bannan-Ritland, 2005; Volery & Lord, 2000; Williams, 2003). Third, technical competencies are considered to be a necessary component for successful learning experiences in online education (Osika & Sharp, 2002; Selim, 2007; Watulak, 2012; Whale, 2006). Moreover, in terms of the influence of technical competencies on online education, Herrera and Mendoza (2011) proposed that technical competencies are a significant predictor for learning outcomes in online learning, which has been confirmed by Cho (2012), Ben-Jacob (2011), and Selim (2007).

However, although several studies have introduced various measures for technical competencies (Osika & Sharp, 2002; Saud et al., 2010; Selim, 2007; Soong et al., 2001; Wozney, Venkatesh, & Abrami, 2006), it is necessary to update these measurements to more adequately and appropriately qualify and quantify the current online learning environment. Most existing student readiness instruments have included basic computer skill questions (Bernard, Brauer, Abrami, & Surkes, 2004; Dray & Miszkiewicz, 2007; Mattice & Dixon, 1999; McVay, 2001; Parnell & Carraher, 2003; Watkins et al., 2004), learner characteristics (Bernard, Brauer, Abrami, & Surkes, 2004; Dray & Miszkiewicz, 2007; Kerr, Rynearson, & Kerr, 2006; Mattice & Dixon, 1999; McVay, 2001; Parnell & Carraher, 2003; Watkins et al., 2004), and demographic questions (Dray & Miszkiewicz, 2007; Mattice & Dixon, 1999). For instance, Bernard and his colleagues developed an online survey with 38 items to measure four categories of learner readiness in online education: a) readiness of online skills; b) readiness of self-management of learning and learning initiative; c) readiness of beliefs about DE/online learning; and d) desire for interaction with an instructor and/or other students (Bernard et al., 2004, p. 33). Osika and Sharp (2002) and Saud et al. (2010) proposed measuring technical competencies that would be considered outdated at this time, such as formatting a disk, copying a file from one disk drive to another, sending and receiving e-mail, and properly starting and shutting down a personal computer.

In summary, it has been revealed that the prevailing student readiness instruments employed in today's online learning are focused on asking computer or Internet related questions in order to measure students' technological abilities to access online courses via computers and/or Learning Management Systems (LMS). However, each student's access to an online course does not always guarantee that student's success. In addition, most existing readiness instruments do not include social readiness although it is a significant factor in online learning. Therefore, other aspects—such as social, communication, and technical competencies—must also be considered as essential components of the student readiness instruments in online learning.

Theoretical Framework

The theoretical framework for this study stems from the work of Tinto (1975) and his Student Integration Model (SIM), which determines factors that can increase student retention. Although Tinto's work was based on traditional face-to-face formats, the principles remain the same for learners in distance classes. He asserted that those students who are not sufficiently integrated into the social and academic aspects of a college or university tend to "dropout" or remove themselves from their purported plans of study. In other words, he stressed the importance of students' social and academic integration into university life as an element necessary to decrease dropout rates (Tinto, 1975; Tinto, 1998; Tinto, 2000; Tinto, 2005; Tinto, 2006; Tinto, 2008). In the SIM, which is the most influential model of student retention in higher education (McCubbin, 2003), Tinto (1975) elucidated which aspects and processes were related to the individual student's decision to leave the college or university and proposed five internal factors as significant predictors of student retention: a) academic integration; b) social

integration; c) goal commitment; d) institutional commitment; and e) the learning community as shown in Figure 1 (p. 95).

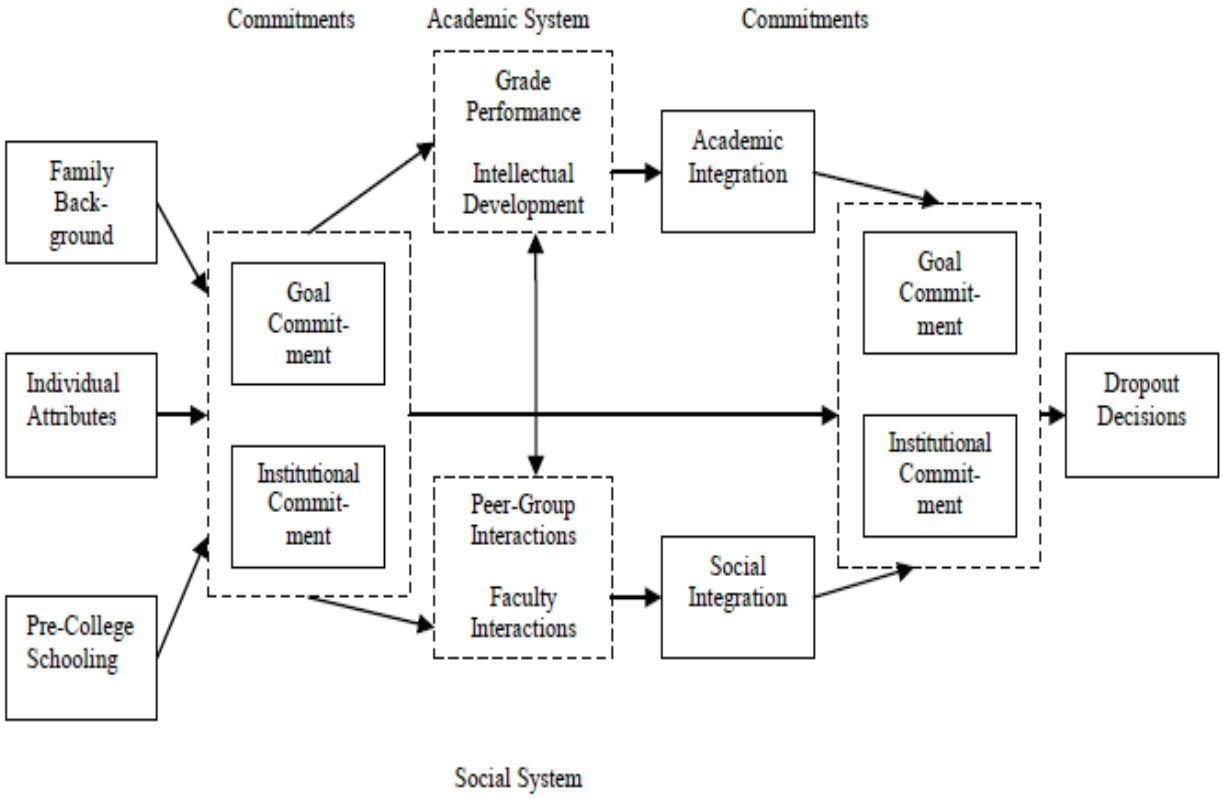


Figure 1. Tinto's Student Integration Model (SIM)

Tinto (1975) considered social integration and academic integration as the most significant factors for student retention among the five internal factors. He asserted that social integration consists of the student's quality of relationship with the course instructor and classmates, whereas academic integration relates to the student's academic performance and their level of intellectual development (Tinto, 1975, Tinto, 1998; Tinto, 2000; Tinto, 2005; Tinto, 2006). In addition, Tinto (1975) claimed that the level of social and academic integration have positive relationships with students' goal commitments and institutional commitments. In other words, students who achieve higher levels of social and academic integration tend to have strong goal commitments and institutional commitments and, as a result, tend not to drop out. Moreover, in the SIM, social integration plays a key role (Tinto, 1975; Tinto, 1998; Tinto, 2000; Tinto, 2005; Tinto, 2006; Tinto, 2008). Tinto (1975) asserted that the student's social integration, such as the student's interaction with course instructors and classmates, may enhance academic integration, help students to form learning communities, and resultantly increase student retention. Based on the SIM, Tinto also proposed three supports which have a positive effect on student retention – social support, academic support, and financial support (Tinto, 1975; Tinto, 1998; Tinto, 2000; Tinto, 2005; Tinto, 2008), and he proposed five conditions for student retention (Tinto, 2006).

While Tinto's model includes elements outside of the scope of this study, such as financial support, it is suitable as a theoretical framework and includes the major elements being studied. Furthermore, Tinto's SIM suggests that there is a significance in social integration, such as students'

interactions with instructors and classmates. In addition, communication competencies are an important element for enhancing student interaction with instructors and classmates (Dabbagh, 2007; Dray & Miszkiewicz, 2007). Last but not least, technical competencies are a substantial component for distance learners as it is the mediating element by which the others are implemented. Therefore, this study proposes the Student Online Learning Readiness (SOLR) Model as a new conceptual model for student retention in online learning that was inspired by Tinto's SIM as shown in Figure 2.

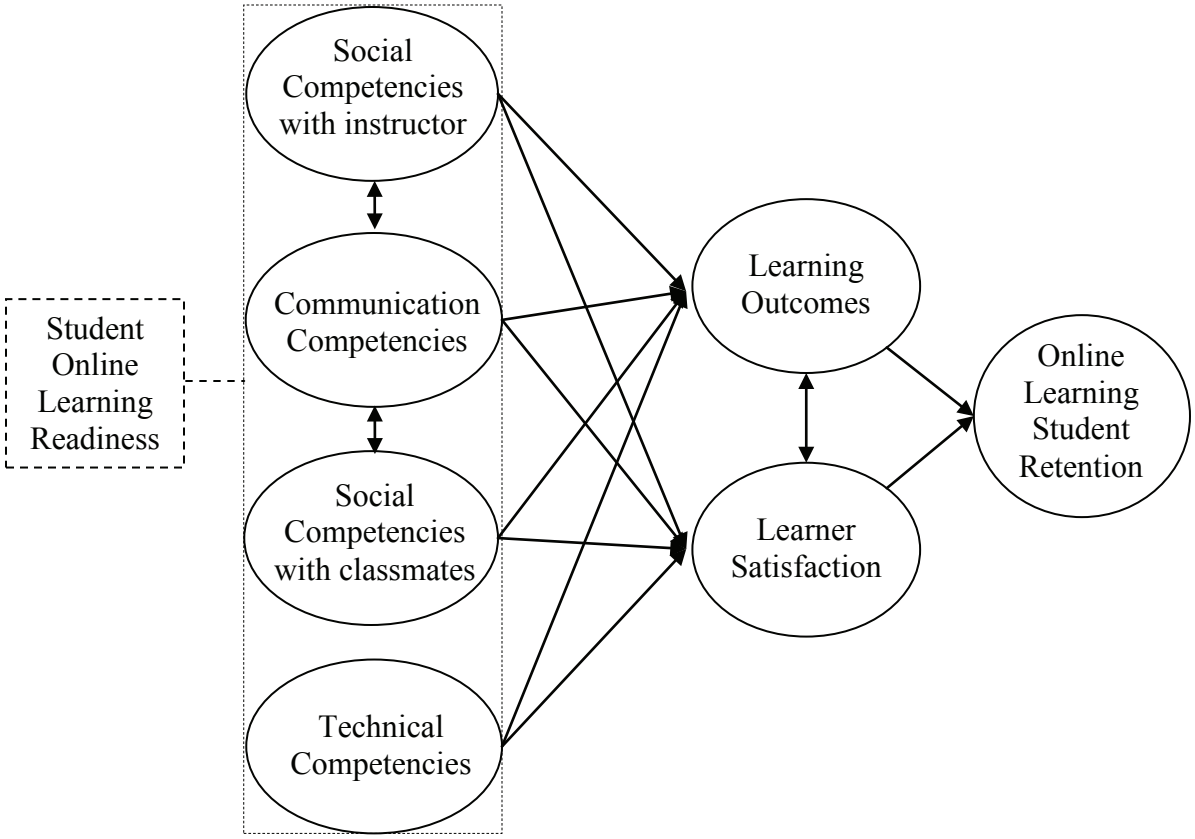


Figure 2. Student Online Learning Readiness (SOLR) Model

The Student Online Learning Readiness (SOLR) Model consists of four components believed necessary to measure student readiness for online learning, such as social competencies with the instructor, communication competencies, social competencies with classmates, and technical competencies. The positive relationships of each component with learning outcomes or learner satisfaction in an online learning environment have been verified in previous research (e.g. for social competencies with the instructor see Shen, Cho, Tsai, & Marra, 2013; for communication competencies see Betermieux & Heuel 2009; for social competencies with classmates see Shen et al., 2013; and for technical competencies see Cho, 2012; Herrera & Mendoza, 2011). In addition, the influence of learning outcomes and learner satisfaction on student retention rates in online learning has been supported (Carey, 2011; Lee & Choi, 2013). That is, student readiness in online learning as measured by social competencies with the instructor, communication competencies, social competencies with classmates, and technical competencies play a significant role in the enhancement of student retention in online learning in the Student Online Learning Readiness (SOLR) Model.

Methods

Research Context

A survey was created and administered using the Purdue Qualtrics system, and the survey links were distributed through Blackboard Learn in the Spring 2014 semester. Twelve online courses at a large Midwestern university were selected across program areas, including social science, engineering, agriculture, and others, in order to reduce possible bias in competencies levels among learners in a particular program. All online courses selected for this study had the following features: a) students were undergraduates; b) the courses were only offered online; c) class assignments and exams were implemented in Blackboard Learn; and d) all instruction was conducted using Blackboard Learn. The total enrollment of the largest class and the smallest class were 200 and 2 respectively. The highest response rate was 85%, whereas the lowest response rate was 20%. Data were checked for duplicate responses by comparing participating students' names and email addresses, and duplicate responses were removed. The average response rate was 51.54%.

Participants

There were 331 students who participated in this study and their majors included psychology, industrial engineering, animal science, computer science, political science, management, and communications. In terms of the academic levels, 47.1% of participating students were seniors, 20.5% were juniors, 17.8% were sophomores, and 14.5% were freshmen. One hundred and eighty seven female students (56.5%) and 144 male students (43.5%) participated in this study. The majority of the participating students in this study (96%) reported being between 18-23 years old. With respect to online learning experiences, 35.3% of the participating students answered that the present course was their first online course and 29.0% of students answered that they had taken at least two online courses, including the present course. Therefore, from the table statistics, one may conclude that at least two thirds of the participating students had participated in one or two online courses, whereas one third of participating students (35.6%) had taken more than two online courses.

Survey Instrument

From the review of literature, 22 self-reported items were selected for this study. The questionnaire used in the current study consisted of five items for the measurement of social competencies with the instructor in online learning (Shen et al., 2013), five items for the measurement of social competencies with classmates in online learning (Shen et al., 2013), six items for the measurement of communication competencies in online learning (Dray et al., 2011; McVay 2001), and six items for the measurement of technical competencies in online learning (Wozney et al., 2006). A five-point Likert scale (1=Disagree, 2=Tend to disagree, 3=Neutral, 4=Tend to agree, 5=Agree) was used for each item.

Social competencies measurement in online learning. The 10-item self-reported measurement of social competencies scale from Shen et al. (2013) was used to measure learners' perceived social competencies in this study. Originally, the Shen et al. (2013) online learning self-efficacy scale consisted of 30 items with five categories: a) self-efficacy to complete an online course (8 items); b) self-efficacy to interact socially with classmates (5 items); c) self-efficacy to handle tools in a Course Management System (CMS) (6 items); d) self-efficacy to interact with instructors in an online course (5 items); and e) self-efficacy to interact with classmates for academic purposes (6 items). However, five items of self-efficacy for interacting with instructors in an online course and five items of self-efficacy for interacting socially with classmates directly related to measuring social competencies in online learning environment were selected for this study. These items were directly related to social competencies to enhance the distance learner's sense of belonging in online courses and had a positive relationship with academic

achievement. In the original Shen et al. (2013) online learning self-efficacy scale, Cronbach's alpha for internal consistency for each subscale was 0.93, 0.92, 0.93, 0.94, 0.93 respectively. Permission to use the questionnaires from Shen et. al.'s (2013) study was obtained for use in this study.

Communication competencies measurement in online learning. To measure communication competencies in online learning, four items from the online learning readiness survey (OLRS) of Dray et al. (2011), and two items from McVay's (2001) student self-evaluation inventory, were adapted for this study. Dray et al.'s (2011) Online Learning Readiness Survey (OLRS) consists of 14 items which were derived from the literature related to the distant learner's readiness for online learning (see Bernard et al., 2004; Mattice & Dixon, 1999; and McVay, 2001). According to Dray and Miszkiewicz (2007), three learner characteristics were each considered as a component for the online learning readiness survey (OLRS), including psychological characteristics (e.g. motivation, attitude, and confidence), learning style (group work, independence, and communication), and situational factors (commuting issues, schedule conflicts, and access). Within these three learner characteristics, four items were designed to measure a distance learner's communication competencies; for the purpose of this study, these four items were selected from the Dray et al. (2011) online learning readiness survey (OLRS). Cronbach's alpha for internal consistency among the six items of self-efficacy subscale was 0.77. Permission to use the questionnaires from both Dray's and McVay's studies was obtained for use in this study.

Technical competencies measurement in online learning. Six items were selected from the instrument by Wozney et al. (2006) and modified to measure distance learners' technical competencies; the original instrument was developed to measure teachers' technical competencies. The original instrument consisted of 33 items related to teachers' attitudes and beliefs toward using computer technology in their classroom, such as "the use of computer technology in the classroom motivates students to get more involved in learning activities" (p. 202). Wozney et al.'s (2006) original instrument consisted of four sections: a) professional views on computer technology; b) background, teaching style, and resources available; c) experience with computer technologies; and d) process of integration. Survey items labeled TC1, 3, 4, and 5 were selected from the section of teacher's process of integration in Wozney et al. (2006). This section was designed to ask teachers about their perceptions of the process of integrating computer technology in teaching activities. Survey items labeled TC2 and TC6 were selected from the section on experience with computer technologies and the section on professional views of computer technology in Wozney et al. (2006), respectively. Because these original items were designed for teachers' technical competencies assessments, they were modified to measure learner's technical competencies in an online learning environment. In terms of internal consistency for the original scale, Cohen's Kappa was 0.86 for Wozney et al. (2006).

Data Analyses

The main purpose of this research phase was to examine the appropriateness of the items and the internal structure of the constructs that the instrument measures. For these reasons, an exploratory factor analysis was first conducted to evaluate the factor structure of the scale. Second, a reliability analysis on pilot items was executed to test the reliability of the preliminary questionnaire set.

Statistical evidence of validity with Exploratory Factor Analysis (EFA). Exploratory factor analysis (EFA) is a statistical method that increases the reliability of the scale by identifying inappropriate items that can then be removed. It also identifies the dimensionality of constructs by examining relations between items and factors when the information of the dimensionality is limited (Netemeyer, Bearden, & Sharma, 2003). For this reason, EFA is performed in the early stages of developing a new or revised instrument (Wetzel, 2011). Before performing EFA, measurement appropriateness for the 22 survey items was evaluated through use of descriptive statistics. To accomplish this, both the mean of all responses and the standard deviations (SD) per item were calculated. If the mean of an item was found to be close to

either 1 or 5, eliminating it as inappropriate should be considered because it may decrease the standard of correlation among the rest of the items (Kim, 2011). Following this step, the normality in distribution was tested by examining skewedness and kurtosis before conducting an exploratory factor analysis. Since the normality of the distribution was confirmed, the exploratory factor analysis was conducted through use of the Statistical Package for the Social Sciences (SPSS, version 22).

In this study, four factors—social competencies with instructor, social competencies with classmates, communication competencies, and technical competencies—were used to determine the structural pattern of the preliminary question set along with a scree plot and eigenvalue (Thompson, 2004). Scree tests, which were introduced by Cattell (1966), plot eigenvalues against the number of factors in order to best determine where a significant drop occurs within factor numbers (Netemeyer, Bearden, & Sharma, 2003). The factor solution was determined based on the number of eigenvalues greater than one (Kaiser, 1960). Following recommendations by Floyd and Widaman (1995), .30 was used as a factor loading criterion in EFA. Kass & Tinley (1979) recommended five to ten participants per item and Comrey & Lee (1992) claimed that a sample size of 200 is fair and 300 is good. In addition, Boomsma (1982) recommended a minimum sample size of 200 to achieve reliable results when conducting a factor analysis.

The exploratory factor analysis process began with an initial analysis run to obtain eigenvalues for each factor in the data. Next, the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (KMO) test and Bartlett's Test of Sphericity were executed to determine construct validity and to confirm that the data collected for an exploratory factor analysis were appropriate. The KMO test was used to verify the sampling adequacy for the analysis, and Bartlett's Test of Sphericity was used to determine if correlations between items were sufficiently large for EFA. Bartlett's Test of Sphericity should reach a statistical significance of less than .05 in order to conduct an EFA. If the results of the initial EFA show items which are loading on the wrong factors or cross-loading on multiple factors, those items are deleted in order and the EFA re-performed until a simple solution is achieved.

Reliability analysis. The reliability of an instrument or questionnaire is concerned with the consistency, stability, and dependability of the scores (McMillan, 2007). For this reason, the internal consistency was tested using Cronbach's alpha for each competency in SPSS. If the alpha value is higher than 0.9, the internal consistency is excellent, and if it is at least higher than 0.7, the internal consistency is acceptable (Blunch, 2008). Excellent internal consistency means that the survey items tend to pull together. In other words, a participant who answers a survey item positively is more likely to answer other items in the survey positively (Blunch, 2008).

Results

Descriptive Statistics

Table 1 (next page) shows the descriptive statistics, including the means, standard deviations, minimums, and maximums of the four proposed factors of the Student Online Learning Readiness (SOLR) instrument. It revealed that participating students had a high level of communication competencies (M = 4.319), social competencies with the instructor (M = 4.272), and technical competencies (M = 4.249), whereas they felt a relatively low level of social competencies with classmates (M = 3.707).

Table 1 *Descriptive statistics of each element of the Student Online Learning Readiness (SOLR) instrument*

	Mean	Std. Deviation	Skewedness	Kurtosis	Min	Max	N
Technical competencies	4.249	.846	-.910	.179	1	5	331
Social competencies with classmates	3.707	1.059	-.580	-.054	1	5	331
Social competencies w/ the instructor	4.272	.873	-.974	.633	1	5	331
Communication competencies	4.319	.807	-.945	.229	1	5	331
Total	4.128	.7055	-.86	.224	1	5	331

The minimum and maximum values were the same in all four competencies—one and five, respectively. In addition, the results supported the variables as normally distributed based on the degrees of skewedness and kurtosis because both were less than the absolute value of one. The rule of thumb was also applied to test the normal distribution of the data because the sample size was larger than 200 participants (Field, 2009). With a large sample, it is more important to visually assess the distribution shape than to test the statistical significance of skewedness and kurtosis (Field, 2009).

Exploratory Factor Analysis (EFA) for Validity

An exploratory factor analysis was conducted on the 22 items with a promax rotation using SPSS. Exploratory factor analysis is a statistical method employed to increase the reliability of the scale by identifying inappropriate items that can be removed and the dimensionality of constructs by examining the existence of relationships between items and factors when the information of the dimensionality is limited (Netemeyer, Bearden, & Sharma, 2003). In this study, the four factors (i.e., technical competencies, social competencies with classmates, social competencies with the instructor, and communication competencies) were used to determine the pattern of the structure in the 22-item Student Online Learning Readiness (SOLR) instrument and were used to create a scree plot (Thompson, 2004).

Preliminary Four-Factor Structure

An initial analysis was run to obtain eigenvalues for each factor in the data. The Kaiser-Meyer-Olkin Measure verified the sampling adequacy for the analysis, KMO=.914 which is above Kaiser's recommended threshold of 0.6 (Kaiser, 1974). Bartlett's test of sphericity, χ^2 (231) = 4364.42, $p < .000$, indicated that correlations between items were sufficiently large for EFA. Four factors had eigenvalues greater than one, as the scree plot clearly illustrates in Figure 3 (next page). The initial 22-item structure explained 65.41% of the variance in the pattern of relationships among the items. The percentages explained by each factor were 41.075% (technical competencies), 10.212% (social competencies with instructor), 7.205% (communication competencies), and 6.923% (social competencies with classmate), respectively.

Based on the results of the initial exploratory factor analysis, there were two items which loaded on two factors in the preliminary four-factor structure. Both items were initially hypothesized to load on

the communication competencies of the initial Student Online Learning Readiness (SOLR) instrument, but they were also loading on technical competencies. The first item was "I am comfortable communicating electronically"; the factor loading on communication competencies was .331, and the cross-loading on technical competencies was .432. The second item was "I am willing to actively communicate with my classmates and instructors electronically"; the factor loading on communication competencies was .317, and the cross-loading on technical competencies was .322.

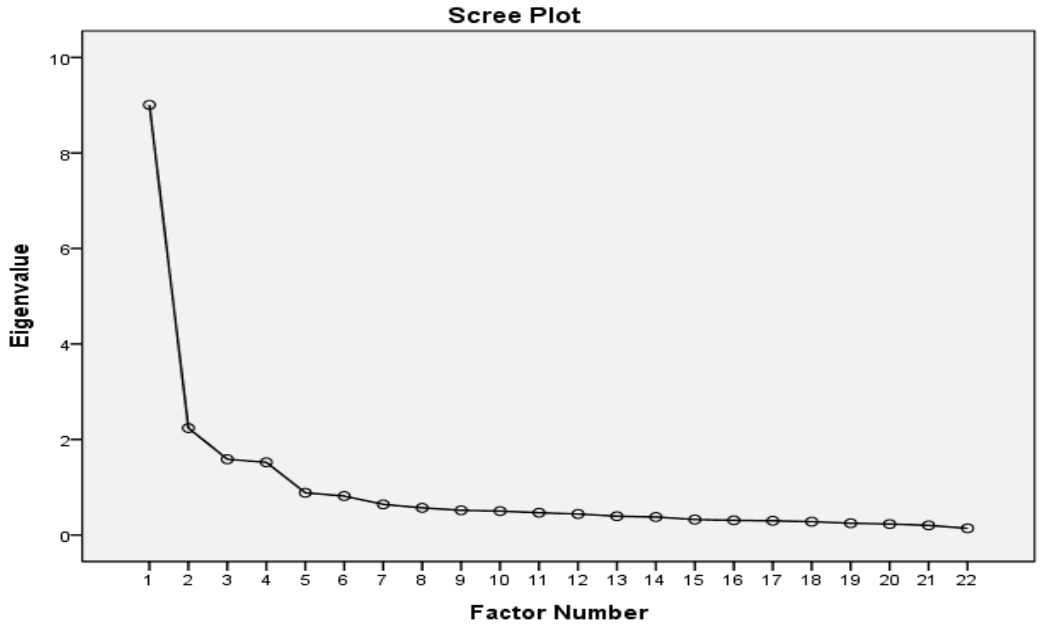


Figure 3. Scree Plot for the Student Online Learning Readiness (SOLR) Instrument

Final Four-Factor Structure

After deleting two items which cross-loaded on two factors, the final four-factor structure in this study was composed of 20 items. As is shown in Table 3 (nect page), six items for factor 1 represent technical competencies, five items for factor 2 represent social competencies with the instructor, and five items for factor 3 represent social competencies with classmates, and four items for factor 4 represent communication competencies. The first item that was deleted was "I'm comfortable communicating electronically" because it had a factor loading of .331 on communication competencies and a cross-loading of .432 on technical competencies. The second item that was deleted was "I am willing to actively communicate with my classmates and instructors electronically" because the factor loading was under .32 (Tabachnick & Fidell, 2013).

Finally, this 20-item structure was found to explain 66.69% of the variance in the pattern of relationships among the items as shown in Table 2 (next page). The percentages explained by each factor were 40.284% (technical competencies), 11.019% (social competencies with instructor), 7.912% (social competencies with classmate), and 7.474% (communication competencies) respectively. Moreover, three competencies (e.g. social competencies, communication competencies, and technical competencies) in this study were highly correlated to each other, as is shown in Table 3. The factor correlation between factor 1 (technical competencies) and factor 2 (social competencies with the instructor) was .612; the correlation between factor 2 and factor 3 (social competencies with classmates) was .456; the correlation

between factor 3 and factor 4 (communication competencies) was .443; the correlation between factor 1 and factor 3 was .369; the correlation between factor 2 and factor 4 was .582; and the correlation between factor 1 and factor 4 was .550.

Table 2 *Eigenvalues, Total Variances Explained for the Final Four-Factor Structure*

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	8.057	40.284	40.284	7.664	38.322	38.322	5.880
2	2.204	11.019	51.303	1.788	8.939	47.262	5.944
3	1.582	7.912	59.215	1.220	6.099	53.361	4.217
4	1. 495	7.474	66.689	1.118	5.590	58.951	5.317

Note: Extraction Method: Principal Axis Factoring.
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 3 *Factor Correlation Matrix*

Factor	1	2	3	4
1	1.000			
2	.612	1.000		
3	.369	.456	1.000	
4	.550	.582	.443	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

In the final four-factor structure of the Student Online Learning Readiness (SOLR) instrument, there was one item which was under .32 factor loading (i.e. I am willing to actively communicate with my classmates and instructors electronically). In fact, Tabachnick and Fidell (2013) suggested deleting those items under .32 factor loading for a better interpretation of the factor structure. These items are not considered to load significantly. However, when choosing to decide appropriately to delete an item under .32 factor loading, this study also examined the Cronbach's α if the item were to be deleted. Although deleting the item was associated with a decrease in α, the item was nonetheless deleted. The original Cronbach's α of factor 1 (technical competencies) was .887 and if the item ("I am willing to actively communicate with my classmates and instructors electronically") is deleted, then the Cronbach's α of factor 1 would be decreased to .882. However, the .005 gap on the Cronbach's α is so minimal it might not be considered as significant. In addition, this item is not strong and shares a potential cross-loading. For this reason, the item ("I am willing to actively communicate with my classmates and instructors electronically") was deleted in this study.

Table 4 *The Items and Final Four-Factor Structure of the Student Online Learning Readiness (SOLR) Instrument after Factor Reduction Procedures*

	Factor			
	1	2	3	4
Factor 1: Technical Competencies				
1. I have a sense of self confidence in using computer technologies for specific tasks.	.988			
2. I am proficient in using a wide variety of computer technologies.	.858			
3. I feel comfortable using computers.	.771			
4. I can explain the benefits of using computer technologies in learning.	.677			
5. I am competent at integrating computer technologies into my learning activities.	.591			
6. I am motivated to get more involved in learning activities when using computer technologies.	.455			
Factor 2: Social Competencies with instructor				
(How confident are you that you could do the following social interaction tasks with your INSTRUCTOR in the ONLINE course?)				
7. Clearly ask my instructor questions.		.917		
8. Initiate discussions with the instructor.		.794		
9. Seek help from instructor when needed.		.753		
10. Timely inform the instructor when unexpected situations arise.		.671		
11. Express my opinions to instructor respectfully.		.630		
Factor3: Social Competencies with classmates				
(How confident are you that you could do the following social interaction tasks with your CLASSMATES in the ONLINE course?)				
12. Develop friendship with my classmates.			.773	
13. Pay attention to other students' social actions.			.768	
14. Apply different social interaction skills depending on situations.			.755	
15. Initiate social interaction with classmates.			.718	
16. Socially interact with other students with respect.			.378	

Factor 4: Communication Competencies	
17. I am comfortable expressing my opinion in writing to others.	.891
18. I am comfortable responding to other people's ideas.	.811
19. I am able to express my opinion in writing so that others understand what I mean.	.754
20. I give constructive and proactive feedback to others even when I disagree.	.700

Item Analysis for Reliability

An item analysis was conducted to test the reliability of each factor of the Student Online Learning Readiness (SOLR) instrument. According to Blunch (2008), satisfactory internal consistency ranges from 0.7 to 0.9. All four factors on this scale had a high rating for reliability. The Cronbach's α for technical competencies, social competencies with the instructor, communication competencies, and social competencies with classmate were .882, .874, .871, and .823, respectively (see Table 5).

Table 5 *Cronbach's Alpha for Each Element of the Student Online Learning Readiness (SOLR) Instrument*

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of items
Technical competencies	.882	.890	6
Social competencies with classmate	.823	.825	5
Social competencies with the instructor	.874	.875	5
Communication competencies	.871	.872	4

Discussion

As a result of our exploratory factor analysis (EFA), four factor-structures of the instrument of student readiness in online learning explained 66.69% of the variance in the pattern of relationships among the items. All four factors had high reliabilities (all Cronbach's $\alpha > .823$). Twenty items remained in the final questionnaire after deleting two item which cross-loaded on multiple factors (social competencies with classmates: 5 items; social competencies with instructor: 5 items; communication competencies: 4 items; and technical competencies: 6 items). As a result, the four-factor structure of the Student Online Learning Readiness (SOLR) instrument has been confirmed through this study.

In addition, it was confirmed that the data included this study was appropriate in order to conduct a valid exploratory factor analysis (EFA) based on the descriptive statistics analysis. The 331-student sample size was large enough for the EFA because it was larger than the suggested sample size of 300 (Comrey & Lee, 1992). Based on the results of the exploratory factor analysis, this study has successfully achieved the simple solution with four-factor structures by deleting two items which cross-loaded on multiple factors. In the initial solution, both factor 2 and factor 4 can be seen to clearly represent social competencies with the instructor and social competencies with classmates, respectively. However, two items cross-loaded on both factor 1 (technical competencies) and factor 3 (communication competencies), such as "I am comfortable communication electronically" and "I am willing to actively

communicate with my classmates and instructors electronically." These two items were supposed to load on factor 3 (communication competencies). But, through the use of the word "electronically" it has been found that there may have been a cross-loading on both communication competencies and technical competencies. Moreover, the factor loadings of these items on factor 1 were .432 and .322, whereas .331 and .317 on factor 3. That is, these items loaded on the wrong factor. Therefore, by deleting the items we felt loaded on the wrong factor (e.g. "I am comfortable communicating electronically" and "I am willing to actively communicate with my classmates and instructors electronically"), I believe that the final solution could be better achieved in this study.

During the first phase of the instrument development process, this study examined the reliability and validity of the instrument. Based on the results of the EFA of this study, educators or administrators can use this Student Online Learning Readiness (SOLR) instrument in order to discover a better understanding of the level of freshmen college students' online learning readiness capabilities by measuring three competencies; social, communication, and technical competencies. Moreover, when students come to understand their level of online learning social readiness, the instrument may provide them with an opportunity to enhance their readiness prior to taking their first online course. However, further research is necessary to examine the relationships which exist among the latent and manifest variables by conducting a confirmatory factor analysis (CFA) (Schreiber, Stage, King, Nora, & Barlow, 2006).

The SOLR can provide student profiles for administrators or institutions which are looking to create student support structures for the success of distance learners in courses or programs. While these social, communication, and technical competencies have been previously verified as critical success factors for online learning in previous research, and while the Student Online Learning Readiness (SOLR) instrument can be used by educators or administrators in higher education, there are other learning characteristics of distance learners which may have an effect on their successful learning outcomes and level of satisfaction in online education. Further research on these other factors is necessary.

Implications

While online learning is becoming a common occurrence in higher education in the United States, it also has given rise to several problems, such as lower retention rates in online courses rather than face-to-face courses. As Tinto (1998) asserted, a low sense of belonging in an online course is one of the significant factors related to lower retention rates in online formats. For this reason, it is necessary for educators and/or administrators to try and instill a sense of belonging for their distance students and to consider how to support their students in order to enhance their own sense of belonging in each online course. The new instrument developed and tested in this study provides a solution for these students. As a theoretical framework, Tinto's (1975) Student Integration Model (SIM) emphasized the importance of social competencies with instructors and classmates on student retention. However, it is more difficult interacting socially with instructors and classmates in online learning environments than in face-to-face classroom settings (Ma & Yuen, 2010). In addition, distance learners' retention rates are significantly lower than traditional students' retention rates (Ali & Leeds, 2009; Angelina, Williams, & Natvig, 2007; Holder, 2007; Lee & Choi, 2011). Therefore, the levels of social competencies with instructors and classmates play a key role in online learning.

In addition, the results of this study have confirmed the four factor structure of the Student Online Learning Readiness (SOLR) instrument which consists of four categories (i.e. social competencies with the instructor, social competencies with classmates, communication competencies, and technical competencies). This study was looking at two factors of social integration in Tinto's SIM and has introduced the Student Online Learning Readiness (SOLR) conceptual model with the purpose of extending Tinto's social integration to an online learning environment. The significant influences of social

competencies (Chen et al., 2010; Parker et al., 2006; Williams, 2003), communication competencies (Betermieux & Heuel, 2009; Dabbagh, 2007; Dabbagh & Bannan-Ritland, 2005; Volery & Lord, 2000; Williams, 2003), and technical competencies (Osika & Sharp, 2002; Selim, 2007; Watulak, 2012; Whale, 2006) have been verified by previous research. Therefore, it is now found to be possible to measure the levels of a learner's social, communication, and technical competencies through use of the Student Online Learning Readiness (SOLR) instrument before the learner takes an online course. Social, communication, and technical competencies are just three factors among other learner characteristics that have positive effects on academic achievement in online learning environments. While these three competencies are not enough to guarantee student success in online learning, we still need to pay more attention to these learner competencies as a starting point of supporting distance learners before they take an online course.

This study also provides two suggestions for practice. First, it provides an idea to consider what types of psychometric properties should be measured to better understand student social readiness in online learning. It is true technological issues such as computer skills, Internet connection, and Learning Management System (LMS) navigation ability have an impact because those are main components of the online learning environment. However, technological skills will not guarantee an improved learning experience alone. Although the online learning environment differs from the traditional face-to-face classroom learning environment, instructors and students still play a main role in the process of learning in an online course. For these reasons, educators and administrators in higher education need to pay more attention to distance learners' competencies in online learning (e.g. social competencies, communication competencies, and technical competencies).

Second, this study provides a suggestion regarding the kinds of supports needed for distance learners to succeed in online learning. To improve the lower retention rate in online learning, institutional supports such as freshmen orientation before taking an online course are significant (Ali & Leeds 2009; Cho, 2012; Lee & Choi, 2011). The Student Online Learning Readiness (SOLR) instrument developed and validated in this study could provide a guide on how to measure student competencies in online learning and what components should be included in their orientations or supports to enhance their student competencies in online learning.

Suggestions for Practice

If learners lack the competency levels necessary to be successful in online courses, they should be provided the opportunity to develop their competencies so as to avoid a more difficult situation involving non-content learning related challenges which could prevent them from succeeding in online learning. However, many educators in higher education are not aware how to measure their learners' social, communication, and technical competencies. Therefore, educators can use the Student Online Learning Readiness (SOLR) instrument to measure learners' competencies in online learning before they take an online course. In addition, it is necessary to provide an adequate social and academic support system in order to enhance students' senses of belonging in online learning—both for an increase in meaningful learning experiences and higher retention rates (Ali & Leeds, 2009; Atchley, Wingenbach, & Akers, 2012; Ludwig-Hardman & Dunlap, 2003). However, existing student readiness instruments tend to ask about the learner's computer skills, technology accessibility, or initial thoughts regarding online learning that are not related to the social aspects of online learning. Therefore, educators also can use the Student Online Learning Readiness (SOLR) instrument as a more contemporary instrument to measure distance learners' readiness by combining social, communication, and technical competencies.

Limitations

There were four limitations with regard to this study. The first limitation related to the analysis method. Exploratory Factor Analysis (EFA) is an advantageous statistical method used to examine the

construct validity and psychometric properties of an instrument. However, because EFA is not a sufficient tool to test the theoretical foundations of the instrument, a Confirmatory Factor Analysis (CFA) should be conducted to further the knowledge in this area. The second limitation of this study is an essential sampling bias. The samples in this study were collected from the online courses at a single university. This sampling process might threaten the ability to generalize the results of this study although various samples were included from different majors or programs. The third limitation is a response bias in questionnaire design. The online survey was distributed with two sections. The first section consisted of 10 items for social competencies and the second section included 12 items for communication and technical competencies. This type of survey formatting might cause acquiescence response bias because it is possible that participants tend to show the similar response patterns in a section. The last limitation in this study related to school setting because participants in this study were not enrolled in complete online programs but rather individual online course(s). Although the survey asked them to answer the questions as a current learner or potential learner in an online course, it is possible participants answered the questions based on experiences as both face-to-face and a distance learners. For this reason, it is possible different results might have been found if this study were conducted with students in a fully online program.

Future Research

For future research, it is recommended this study be repeated with students from multiple colleges or universities to overcome the statistical sampling bias. Another recommendation is to conduct a Confirmatory Factor Analysis (CFA) to test predictive validity of the Student Online Learning Readiness (SOLR) instrument since this study focused on Exploratory Factor Analysis (EFA) and reliability analysis to test the reliability and validity of the instrument. In addition, it is recommended further research be conducted to compare student readiness between students enrolled in a fully online program and those that are taking a single online course. This study did not consider the possible effect on the research results depending on the reason why students took the online courses. A final suggestion is to extend this study to other significant success factors in online learning (e.g. motivation, self-efficacy) in order to better measure student readiness in online learning more precisely and further refine the theoretical framework for the SOLR.

References

Ali, R., & Leeds, E. (2009). The impact of classroom orientation in online student retention. *Online Journal of Distance Learning Administration, 12*(4). Retrieved from http://www.westga.edu/*distance/ojdla/winter124/ali124.html.

Allen, I. E., & Seaman, J. (2013). *Changing course: ten years of tracking online education in the United States*. Babson Survey Research Group and Quahog Research Group, LLC. Retrieved from http://www.onlinelearningsurvey.com/reports/changingcourse.pdf

Allen, I. E., & Seaman, J. (2014). *Grade change: tracking online education in the United States*. Babson Survey Research Group and Quahog Research Group, LLC. Retrieved from http://www.onlinelearningsurvey.com/reports/gradechange.pdf

Anderson, P. K. (2014). University education as relational: the challenge of online studies. *Contemporary PNG Studies: DWU Research Journal, 19*, 36-49.

Angelina, L. M, Williams, F. K., & Natvig, D. (2007) Strategies to engage online students and reduce attrition. *Journal of educators online, 4*(2). 3-14.

Atchley, T., Wingenbach, G., & Akers, C. (2013). Comparison of course completion and student performance through online and traditional courses. *The International Review of Research in Open and Distance Learning, 14*(4). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1461

Bakia, M., Shear, L., Toyama, Y., & Lasseter, A. (2012). *Understanding the implications of online learning for educational productivity*. Washington, DC: U.S. Department of Education, Office of Educational Technology. Retrieved from http://www.sri.com/sites/default/files/publications/implications-online-learning.pdf

Battistich, V., Solomon, D., Watson, M., & Schaps, E. (1997). Caring school communities. *Educational Psychologist, 32*, 137-151.

Ben-Jacob, M. (2011). Technology and critical inquiry: a necessary foundation for today's student. Proceedings of *the World Conference on Educational Multimedia, Hypermedia and Telecommunications 2011* (pp. 3388-3391). Chesapeake, VA: AACE.

Bernard, R.M., Brauer, A., Abrami, P.C., & Surkes, M. (2004). The development of a questionnaire for predicting online learning achievement. *Distance Education, 25*(1), 31-47.

Betermieux, S., & Heuel, E. (2009). *Design and use of a web based support tool for students' self-management in university and distance university settings*. Paper presented at the World Conference on Online learning in Corporate, Government, Healthcare, and Higher Education 2009, Chesapeake, VA.

Blunch, N. J. (2008). *Introduction to structural equation modelling using SPSS and AMOS*. Thousand Oaks, CA: Sage Publications Ltd.

Boomsma A. (1982). The robustness of LISREL against small sample sizes in factor analysis models. In H. Wold & K. Jöreskog (Eds.), *Systems under indirect observations* (pp. 147-173). New York: Elsevier North-Holland.

Carey, J. M., (2011). Effective student outcomes: a comparison of online and face-to-face delivery modes. *DEOSNEWS, 11*(9). Retrieved from http://learningdesign.psu.edu/deos/deosnews11_9.pdf

Carr, S. (2000). As distance education comes of age, the challenge is keeping the students. *The Chronicle of Higher Education*, February 11, A39.

Cattell, R. B. (1966). The meaning and strategic use of factor analysis. In R. B. Cattell (Ed.), *Handbook of multivariate experimental psychology* (pp. 174-243). Chicago: Rand McNally.

Chen, X., Huang, X., Chang, L., Wang, L., & Li, D. (2010). Aggression, social competence, and academic achievement in Chinese children: a 5-year longitudinal study. *Development and Psychopathology, 22*(Special Issue 03), 583-592. doi:10.1017/S0954579410000295.

Cho, M.-H. (2012). Online student orientation in higher education: a development study. *Educational Technology Research and Development, 60*(6), 1051-1069.

Cho, M.-H., & Jonassen, D. (2009). Development of the human interaction dimension of the self-regulated learning questionnaire in asynchronous online learning environments. *Educational Psychology, 29*, 117-138.

Cho, M.-H., Shen, D., & Laffey, J. (2010). Relationships between self-regulation and social experiences in asynchronous online learning environments. *Journal of Interactive Learning Research, 21*, 297-316.

Comrey, A. L. & Lee, H. B. (1992). *A first course in factor analysis* (2nd edition). Hillsdale, NJ: Erlbaum.

Dabbagh, N. (2007). The online learner: characteristics and pedagogical implications. *Contemporary Issues in Technology and Teacher Education, 7*(3), 217-226. Retrieved from http://www.citejournal.org/vol7/iss3/general/article1.cfm.

Dabbagh, N., & Bannan-Ritland, B. (2005). *Online learning: concepts, strategies, and application*. Upper Saddle River, NJ: Prentice Hall.

Dray, B.J., & Miszkiewicz, M. (2007). The intersection of learner characteristics and technology capabilities: implications for online learning. Paper presented at the *2007 AERA Annual Meeting*, Chicago, IL.

Duck, J. M., & Parente, D. H. (2014). How do we get to tomorrow? The path to online learning. *Developments in Business Simulation and Experiential Learning, 35*, 353-354.

Field, A. P. (2009). *Discovering statistics using SPSS*. London, England : SAGE.

Flook, L., Repetti, R. L., & Ullman, J. B. (2005). Classroom social experiences as predictors of academic performance. *Developmental Psychology*, *41*(2), 319-327.

Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment, 7*(3), 286-299.

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology, 95*(1), 148-162.

Goodenow, C. (1993). The psychological sense of school membership among adolescents: scale development and educational correlates. *Psychology in the Schools, 30*, 70-90.

Heo, M. (2011). Improving technology competency and disposition of beginning pre-service teachers with digital storytelling. *Journal of Educational Multimedia and Hypermedia, 20*(1), 61-81.

Herrera, L., & Mendoza, N. (2011). Technological and pedagogical perceptions on b-learning from two opposite academic programs. Proceedings of *the World Conference on Educational Multimedia, Hypermedia and Telecommunications 2011* (pp. 1078-1084). Chesapeake, VA: AACE.

Holder, B. (2007). An investigation of hope, academics, environment, and motivation as predictors of persistence in higher education online programs. *Internet & Higher Education, 10*(4), 245-260. doi:10.1016/j.iheduc.2007.08.002.

Jun, J. (2005). Understanding E-dropout. *International Journal on E-Learning, 4*(2), 229-240.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*, 141-151.

Kaiser, H.F. (1974) An index of factorial simplicity. *Psychometrika, 39*, 31-36.

Kass, R. A. & Tinsley, H. E. A. (1979). Factor analysis. *Journal of Leisure Research, 11*, 120-138.

Kerka, S. (1998). *Competency-based education and training. Myths and realities*. Retrieved from http://www.calpro-online.org/eric/textonly/docgen.asp?tbl=mr&ID=65.

Kerr, M.S., Rynearson, K., & Kerr, M.C. (2006). Student characteristics for online learning success. *The Internet and Higher Education, 9*(2), 91-105.

Kim, J. (2011). Developing an instrument to measure social presence in distance higher education. *British Journal of Educational Technology, 42*(5), 763-777. doi: 10.1111/j.1467-8535.2010.01107.x.

Lee, Y., & Choi, J. (2011). A review of online course dropout research: implications for practice and future research. *Educational Technology Research and Development, 59*, 593-618.

Lee, Y., & Choi, J. (2013). A structural equation model of predictors of online learning retention. *The Internet and Higher Education, 16*, 36-42.

Link, D. & Scholtz, S. (2000). Educational technology and faculty role: what you don't know can hurt you. *Nurse Educator, 25*(6), 274-276.

Ludwig-Hardman, S., & Dunlap, J. C. (2003). Learner support services for online students: scaffolding for success. *International Review of Research in Open and Distance Learning, 4*(1), 1-15.

Ma, W., & Yuen, A. (2010). Understanding online knowledge sharing: an exploratory theoretical framework. Proceedings of *Third International Conference of Hybrid Learning* (pp 239-248). Beijing, China: ICHL.

Mattice, N. J., & Dixon, P. S. (1999). *Student preparedness for distance education* (Research Report). Santa Clarita, CA: College of the Canyons.

McCubbin, I. (2003). *An examination of criticisms made of Tinto's 1975 student integration model of attrition*. Retrieved from http://www.psy.gla.ac.uk/~steve/localed/icubb.pdf.

McInnerney, J. M., & Roberts, T. S. (2004). Online learning: social interaction and the creation of a sense of community. *Educational Technology & Society, 7*(3), 73-81.

McMillan, J.H. (2007). *Classroom assessment: principles and practice for effective standards-based instruction* (4th ed.). Boston: Pearson.

McVay, M. (2001). *How to be a successful distance education student: learning on the Internet*. New York: Prentice Hall.

Moore, M., & Kearsley, G. (2005). *Distance education—a system view*. Belmont, CA: Wadsworth Publishing Company.

Myllylä, M., & Torp, H. (2010). Second Life in building social competence in teacher education. Proceedings of *the Society for Information Technology & Teacher Education International Conference 2010* (pp. 2795-2798). Chesapeake, VA: AACE.

Netemeyer, R. G., Bearden, W. O., & Sharma, S. (2003). *Scaling procedures: issues and applications*. Sage Publications, London.

Osika, E. R., & Sharp, D. P. (2002). Minimum technical competencies for distance learning students. *Journal of Research on Technology in Education 34*(3), 318-325.

Osterman, K. F. (2000). Students' need for belonging in the school community. *Review of Educational Research, 70*, 323-367.

Parker, J. D. A., Hogan, M. J., Eastabrook, J. M., Oke, A., & Wood, L. M. (2006). Emotional intelligence and student retention: predicting the successful transition from high school to university. *Personality and Individual Differences, 41*(7), 1329-1336.

Parnell, J.A., & Carraher, S. (2002). The role of effective resource utilization in strategy's impact on performance. *International Journal of Commerce and Management, 13*(3), 1-34.

Reio, T. G., & Crim, S. J. (2006). The emergence of social presence as an overlooked factor in asynchronous online learning. Paper presented at *the Academy of Human Resource Development International Conference (AHRD)*, Columbus, OH.

Poellhuber, B., Chomienne, M., & Karsenti, T. (2008). The effect of peer collaboration and collaborative learning on self-efficacy and persistence in a learner-paced continuous intake model. *Journal of Distance Education, 22*(3), 41-62.

Saud, M. S., Buntat, Y., Minghat, A. D., & Subari, K. (2010). Competency, importance and educational needs of online learning technology (OLT) competencies perceived as needed by technical and vocational teacher in malaysia. *European Journal of Social Sciences, 14*(4), 621-627.

Schreiber, J. A., Stage, F. K., King, J., Nora, A., & Barlow, E. A. (2006). Reporting structural equation modeling and confirmatory factor analysis results: a review. *The Journal of Educational Research, 99*, 323-337.

Selim, H. M. (2007). Critical success factors for online learning acceptance: confirmatory factor models. *Computers & Education, 49*, 396-413.

Shen, D., Cho, M., Tsai, C., & Marra, R. (2013). Unpacking online learning experiences: online learning self-efficacy and learning satisfaction. *Internet and Higher Education, 19*, 10-17.

Smith, T. C. (2005). Fifty-one competencies for online instruction. *The Journal of Educators Online, 2*(2), 1-18.

Soong, M. H. B., Chan, H. C., Chua, B. C., & Loh, K. F. (2001). Critical success factors for on-line course resources. *Computers & Education*, *36*(2), 101-120.

Spector, J. M. (2001). Glossary of IBSTPI instructional design terms. In R. C. Richey, D. C. Fields, & M. Foxon (Eds.), *Instructional Design Competencies: The Standards*. Syracuse (pp. 179-184). New York: ERIC Clearinghouse on Information & Technology.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*, 6th ed. Boston: Pearson.

Thompson, B. (2004). *Exploratory and confirmatory factor analysis: understanding concepts and applications*. American Psychological Association, Washington DC.

Tinto, V. (1975). Dropout from higher education: a theoretical synthesis of recent research. *Review of Educational Research, 45*(1), 89-125.

Tinto, V. (1988). Stages of student departure: reflections on the longitudinal character of student leaving. *Journal of Higher Education, 59*(4), 438-455.

Tinto, V. (1993). *Leaving college: rethinking the causes and cures of student attrition* (2nd ed.). Chicago: University of Chicago Press.

Tinto, V. (1998). Colleges as communities: taking research on student persistence seriously. *The Review of Higher Education, 21*(2), 167-177.

Tinto, V. (2000). Taking retention seriously: rethinking the first year of college. *NACADA Journal, 19*(2), 5-10.

Tinto, V. (2005). Reflections on student retention and persistence: moving to a theory of institutional action on behalf of student success. *Studies in Learning, Evaluation, Innovation and Development, 2*(3), 89-97.

Tinto. V. (2006). Taking student retention seriously. Keynote presentation and paper at *Maricopa Community College District*, 6 January. Retrieved from http://www.umesgolf.com/assets/0/232/3812/4104/4110/bd28b4ae-e1cc-4575-9b37-535d2d2be5f1.pdf

Tinto. V. (2008). Access without support is not opportunity. Paper presented at *the 36th Annual Institute for Chief Academic Officers*, The Council of Independent Colleges, Seattle, Washington.

Volery, T., & Lord, D. (2000). Critical success factors in online education. *The International Journal of Educational Management, 14*(5), 216-223.

Watulak, S. L. (2012). 'I'm not a computer person': negotiating participation in academic discourses. *British Journal of Educational Technology, 43*(1), 109-118.

Wetzel, A. P. (2011). *Factor analysis methods and validity evidence: a systematic review of instrument development across the continuum of medical education*. Unpublished doctoral dissertation: Virginia Commonwealth University.

Whale, D. (2006). Technology skills as a criterion in teacher evaluation. *Journal of Technology and Teacher Education, 14*(1), 61-74.

Williams, P. E. (2003). Roles and competencies of distance education programs in higher education institutions. *The American Journal of Distance Education, 17*(1), 45-57.

Wozney, L., Venkatesh, V., & Abrami, P. (2006). Implementing computer technologies: teachers' perceptions and practices. *Journal of Technology and Teacher Education, 14*(1), 173-207.

Yu, T. (2014). Student readiness for online learning: the role of social, emotional and technical competencies. In R. L. Patrick, C. S. York, & J. C. Richardson (Eds.), *Online Learning: Common Misconceptions, Benefits and Challenges* (pp. 17-31). New York: Nova Science Publishers, Inc.

Zawacki-Richter, O. (2004). The growing importance of support for learners and faculty in online distance education. In J. E. Brindley, C. Walti, & O. Zawacki-Richter (Eds.), *Learner Support in Open, Distance and Online Learning Environment* (pp. 51-62). Bibliotheks- und Informationssystem der Universität Oldenburg.

Planning for Online Education: A Systems Model

Anthony G. Picciano
Graduate Center—City University of New York

Abstract

The purpose of this article is to revisit the basic principles of technology planning as applied to online education initiatives. While not meant to be an exhaustive treatment of the topic, the article is timely because many colleges and universities are considering the development and expansion of online education as part of their planning activities. The article suggests that purposeful planning is key to the successful implementation of online education as opposed to disruption or radical transformation that may be damaging to an institution's culture.

Introduction

In September 2005, the recently appointed president to the University of Illinois, B. Joseph White, announced an initiative to establish the Illinois Global Campus (IGC). Designed to offer online learning programs to students throughout the world, IGC sought to leap into the 21st century with an original enrollment goal of 70,000 new students by 2018. However, a number of issues quickly arose such as its planned for-profit nature, its extensive dependence on adjunct faculty, and its lack of integration with existing university programs. Nicholas Burbules, who served as chair of the faculty senate at the University of Illinois at Urbana-Champaign, said many professors worried that without faculty oversight, the IGC would be handing out degrees that carried the University of Illinois seal but did not reflect its standards. (Kolowich, 2009) Burbeles further commented:

> One of the big mistakes of the Global Campus was its big upfront expenses (they bought computers, servers, hired staff, remodeled space), then had to bring in revenue to cover their expenses. They were instantly under pressure from the board to show income to help defray the expenses. (Des Garennes, 2012)

Likewise, Charles Evans, associate vice president of academic affairs and a former Global Campus administrator, was quoted as saying: "'I think the idea of minimizing the role of faculty at a place like the UI was the fundamental flaw' of the Global Campus" (Des Garennes, 2012). As a result, in May 2009, the University of Illinois Board of Trustees , voted to end the IGC after an investment of $18 million and an enrollment of approximately two hundred students.

The IGC case serves as an example of an online education initiative that had serious flaws in its planning and due diligence. Poor environmental scanning, questionable financial projections, and lack of faculty support doomed the venture. The fundamental concept underlying the IGC was not problematic but the planning and implementation proved to be its downfall. The purpose of this article is to revisit the basic principles of technology planning as applied to online education initiatives. While not meant to be an exhaustive treatment of the topic, the article is timely because many colleges and universities are considering the development or expansion of online education. Allen & Seaman (2014) who have been surveying online learning in American higher education since 2002, indicate that close to seventy percent of chief academic officers consider online learning as critical to their long-term strategic planning.

One of the most fully-studied topics in educational administration is planning. Numerous books, articles, and guides have been written on how to plan and whom to involve in educational planning. Journals devoted entirely to issues of planning are available that enable administrators to keep up-to-date with the most current thinking. Consultants abound conferences where sessions are routinely dedicated to planning, its theories, and practices. This article will not provide a review of this extensive literature, but will instead provide a framework for technology planning as applied to online education. For a more extensive treatment of technology planning, readers are encouraged to consider the following:

- *Managing Technology in Higher Education: Strategies for Transforming Teaching and Learning* (Bates and Sangra, 2011, Jossey-Bass).
- *Educational Leadership and Planning for Technology, 5th Edition* (Picciano, 2010, Pearson)
- *Integrating Educational Technology into Teaching, 6th Edition* (Robyler, 2012, Pearson)

Professional organizations such as EDUCAUSE, the Online Learning Consortium, iNACOL, and United States Distance Learning Association also provide planning and implementation resources on their websites.

The first part of this article will focus on a conceptual framework for technology planning, followed by a discussion of practical examples which highlight the model's use in online education. The article will conclude with an integration of the ideas presented, especially the need for purposeful planning rather than unplanned and potentially negative disruption or radical transformation.

Definitions of Terms

Two key concepts—planning and online education—need to be defined in order to establish a basis for this article.

A generally accepted definition of planning is elusive. In one extensive review of the literature, Adams (1987) provided at least seven different definitions, all of which he considered incomplete. One obvious reason is that planning means different things to different people and is done for different purposes. However, elements common to any definition involve individuals thinking about and developing strategies to prepare their organizations for the future. It is also understood that planning goes on in all organizations although it may take on different characteristics. Planning can be structured, formal, top-down, and non-participatory in some cases; or unstructured, informal, bottom-up, and highly participatory in others. It can also involve complex social and administrative phenomena related to

financial resources, personalities, and individual and departmental needs. Schools, colleges, and universities are social systems that in the course of their activities—including planning—usually consider the social needs of students, teachers, administrators, and communities within the context of the larger social environment. The redirection of the various definitions of planning to these common elements will serve to define and describe planning for purposes of this article. This approach may be considered an oversimplification of a very complex topic, however, it recognizes and respects a variety of existing situations.

This article will treat online education as it exists on the Internet and World Wide Web. Although online education applications using local and wide area networks existed before the Internet, the primary model that evolved over the past twenty years relies on ubiquitous data communications that are owned and operated routinely by all segments of the population. Today, large percentages of people living in countries throughout the world use laptops, cell phones, and other portable devices to stay connected with family, friends, and their studies. The term online education is used to encompass all forms of teaching and learning using the Internet. It also refers to the plethora of names and acronyms that have evolved over the past two decades including: online learning, e-learning, blended learning, web-enhanced learning, hybrid learning, flipped classrooms, and MOOCs (massive open online courses).

The Systems Model

Various theories and models have been developed to describe and explain the way education institutions operate in our society. Most of them stem from general organization theory and development. The writings of classical organizational theorists such as Chester Barnard (1964), Herbert Simon (1960, 1982), Talcott Parsons (1958), and Amitai Etzioni (1961) are cited in basic administration courses and form the foundation of much of our knowledge in this area. More recent organization theorists such as Senge (2006), Fullan (2001), and Wenger (2000) have expanded on earlier theories and applied them to modern organizations that are dealing with societal and cultural shifts, globalization, and technology. he literature in educational administration deals with topics such as organizational culture, strategic planning, environmental scanning, transformational leadership, and shared decision making. The common thread underlying this material is the assumption that schools and colleges operate as part of their larger societies. Faculty, students, and administrators interact with each other and also interact individually and collectively with their communities and larger societies.

Based on these assumptions, a social systems model of planning for technology can be developed. This model can be used for any type of organization (corporation, university, K-12 school district), however, for the purposes of this article, the model will be customized to reflect a college/university environment (see Figure 1). This model shows planning for technology as proceeding from values defined by the environment and the institution toward goals and objectives formulated primarily at the college/university. Typically values are documented and modified in a mission statement. To achieve goals and objectives, technology applications are identified as the main courses of action that in turn require hardware and software, staff, facilities, finances, and policies to be implemented or provided for at the local college/university level. Once in place, they are subsequently evaluated, and feedback is provided to the planning process for establishing new goals, objectives, and applications and for revising existing ones. The model requires a good deal of information gathering and idea sharing, which may be done formally through committees as well as informally through ad hoc discussions, observations, visits, and reading the literature. This model should be integrated with other planning activities at the college or university.

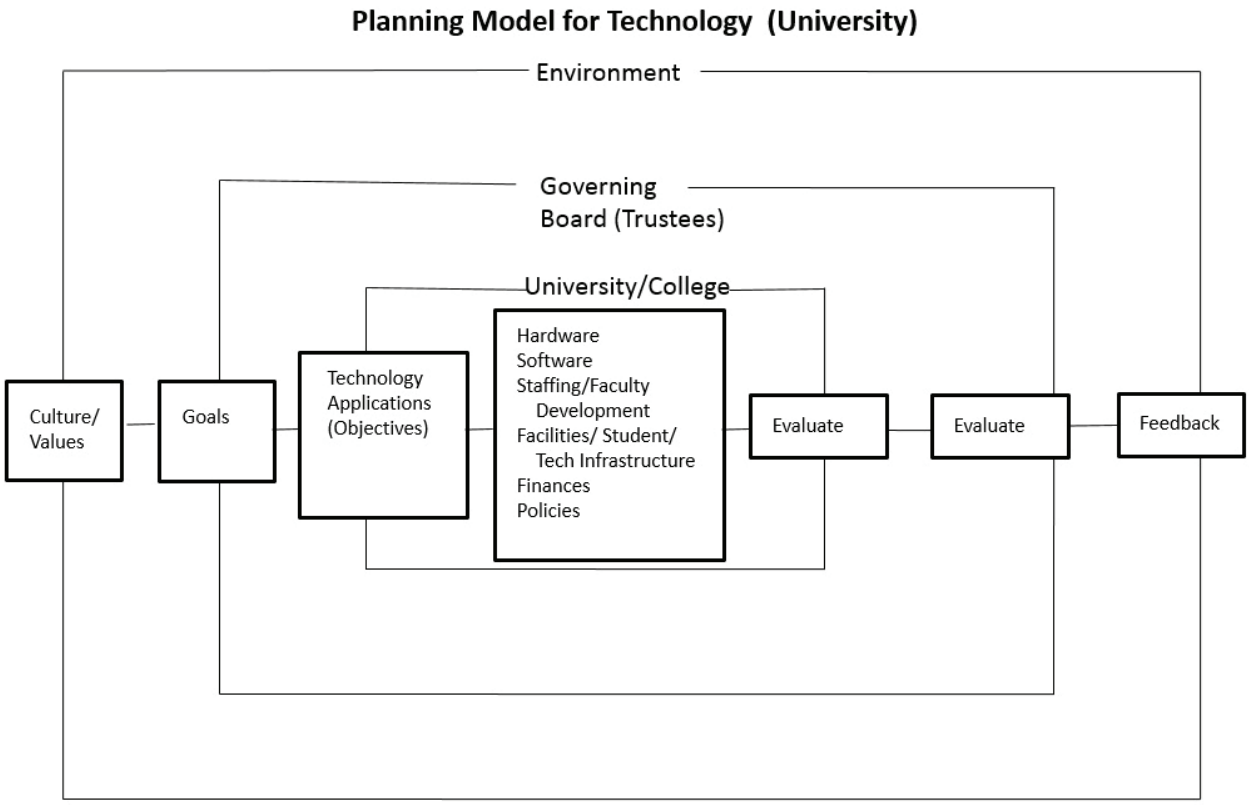


Figure 1 – Planning Model for Technology for a University/College

An important feature of this model is that it incorporates external *environmental scanning*, which simply means engaging in activities that provide information about the community, state, and society for planning purposes. In addition to understanding societal and community values, environmental scanning is critical for comprehending changes in technology. The fundamental nature of technology involves change—in the field of digital communications, rapid change. In a global, high-tech world, organizations need to be fluid, inclusive, and responsive (Kanter, 1997). For those involved in technology, this can be frustrating as well as invigorating. Based on a study in seven countries, Collis and van de Wende (2002) provided excellent insights into the nature of the types (i.e., systemic, gradual, changing the mould) of organizational change that occur when colleges and universities implement ICT projects.

Monitoring trends in hardware and software development enables planners to avoid technology that might soon become obsolete. Successful environmental scanning also involves establishing and developing contacts with experts in the community, professional organizations, and private businesses. A basic component of this model is an administrator who provides the necessary leadership in converting environmental values and conditions into college/university-wide goals and objectives. However, the model assumes stakeholders (faculty, students, alumni, community members) are involved with the process of converting values into goals and objectives as well.

A good plan covers a specific period of time, frequently from 5 to 7 years, allowing for more inclusion than exclusion. Administrators should attempt to be equitable in distributing resources among competing stakeholders. If resources are severely limited, then a major goal of the planning participants should be securing more funds before developing applications. The participation of alumni and

community representatives may help identify and develop financial support from external sources including governmental (federal, state, local) and private agencies.

A pivotal step in using the technology planning model is the development of an articulated plan. The purpose is to provide clear framing of the specifications to all participants. Just as information flow is critical in the formative stages of planning, a written summary of what has been discussed and agreed upon is essential for implementing the plan. Participants and others such as board members, administrators, faculty, students, and alumni need to understand what the goals are and what their responsibilities are in achieving them.

Evaluation and feedback are critical for continuing planning activities from year to year and from planning cycle to planning cycle. Participants need information on how well technology applications are achieving objectives. This can only be provided if mechanisms are established for evaluating applications and generating feedback.

Planning for Online Education

The following sections of this paper will focus on planning for online education as an example of the systems model in operation. It is important to bear in mind that online education would be one of the applications being considered within an overall technology plan. Other applications related to administration or other areas of instruction (statistical software, digital research equipment, library databases) not related to online education would be part of the overall campus technology plan.

Environmental Scanning

Understanding the environment is a beginning point for any planning activity including the development or enhancement of online education applications. Participants at any level can be of assistance in this aspect of planning. Governing boards and trustees, for example, are appointed specifically from outside the university or college to provide guidance on matters of mission, policy, and future directions. College administrators can consult with and seek guidance from trustees in identifying external developments that might affect the university. Administrators should also seek assistance from those within the university (institutional research, external affairs, faculty) in identifying developments in the community, region, and beyond that might be of importance. The ubiquity of the Internet has facilitated environmental scanning at all levels. At the same time, because of its dynamic nature, technology itself should be monitored on a regular basis especially in an area such as online education.

In scanning the online education environment, it is safe to say that we are well beyond the beginning stages. Online education via the Internet developed twenty years ago in the early and mid-1990s. The leaders of this development were distance education providers in both the non-profit and for-profit sectors of higher education. The focus at that time was on harnessing online technology to deliver instruction to distant student populations, most of whom were relying on slow-speed communications equipment. The fully online, asynchronous course became the fundamental method of choice. By the end of the 1990s, mainstream higher education started to consider online learning as part of its mission and began developing models based on their pedagogical benefits rather than serving distant student populations. Institutions began to integrate online with face-to-face delivery in a myriad of blended formats that took advantage of the best of both worlds. This continued until 2008 when massive, open, online course (MOOC) development caught the attention of universities, policy makers, and the media. The massiveness of MOOCs was the most important and intriguing aspect of this format. Courses enrolling tens of thousands of students could not be ignored. They were celebrated for their cost-effectiveness and ability to reach the masses. Pedagogically-speaking there was little new about MOOCs and after a period of experimentation and evaluation, the MOOC model fell short of media's hype.

Sebastian Thrun, former professor at Stanford University, founder of Udacity and the face of the MOOC movement, opened the flood gates for criticism in an interview with *Fast Company*, when he was quoted as saying that he was throwing in the towel and that "we [Udacity] have a lousy product" (Chafkin, 2013). Actually Thrun may have been too harsh on his company, but the quote was out there and doubts about the efficacy of MOOCs grew. Other experiments with MOOCs such as those at San Jose State University pointed to excessively high dropout rates and modest student performance that raised even more questions about their efficacy (Collins, 2013). At the present time, while traditional distance education providers such as the Penn State World Campus, the University of Maryland—University College, and the University of Phoenix, continue to rely essentially on an asynchronous, fully online model, mainstream higher education is pursuing a reconciliation of the pedagogically-rich blended model and the cost-effective MOOC model. In addition, social media, big data/learning analytics, adaptive learning, mobile computing, competency-based learning, and gaming are also being integrated into online education.

Other significant higher education trends indirectly related to the role that technology and online education play in responding to the environment include: 1) *expanding enrollment*—the number of students seeking a higher education continues to expand at all levels; 2) *life-long learning*—students are seeking more advanced degrees as well as other higher credentials and no longer see higher education as strictly for 18 to 21 year-old traditional students; 3) *retention/attrition*—student attrition has evolved as a major issue for higher education especially at open admissions and less-selective colleges; 4) *rising tuition* continues and has surpassed state funding in public higher education**;** 5) *student loan debt*—continues to rise; 6) *government oversight*—the US. Department of Education has initiated a number of proposals to foster greater accountability for colleges and universities; and 7) *commoditization*—higher education is increasingly being seen and pursued as a personal benefit rather than as a public good. Colleges and universities should contemplate where they see themselves in terms of the these seven issues and should consider whether online education has a role to play in addresssing them. Where does it fit in their plans? Where does the instituion fit within the evolution of online education? Are they at the beginning or at an advanced stage? Do they need to refine or modify what they are already doing or do they need to make a major leap forward? This last question is most important and the answer depends upon an institution's mission, culture, and goals.

Developing Goals - Colleges are Not All the Same

Colleges and universities have different missions and goals, serve different constituents, and will approach online education in different ways. The Carnegie Classification of Institutions of Higher Education starts with six basic categories: Associate Degree Colleges, Baccalaureate Colleges, Masters Colleges and Universities, Doctoral-Granting Universities, Special Focus Institutions, and Tribal Colleges. This classification expands considerably depending upon the nature of the academic programs, size of the student body, locale, non-profit or for-profit status, and level of research. Community colleges, for example, provide access to higher education as their primary goal. They generally serve local commuter student populations by offering a range of academic programs designed to enhance employment opportunities or to enable students to transfer to a four-year institution. Private four-year liberal arts colleges focus on providing a high-quality undergraduate experience for their largely residential students. Social life and campus experiences at a private liberal arts college are as important as the academic programs. Research institutions offer a variety of undergraduate and graduate programs and are quite active in securing grants, corporate contracts, and other external funding. Faculty at these institutions see research, scholarship, and grantsmanship as primary responsibilities. As a result, how these institutions approach online education will differ. A community college might seek to use fully online courses and programs as vehicles to broaden student access or to help enrolled students to remain in their programs when family, financial, and other responsibilities might pressure them to withdraw. The four-year liberal arts college might prefer to take advantage of the pedagogical benefits of blended

learning applications that can be integrated into traditional classrooms. Research institutions might use online education to extend graduate expertise or to brand their programs nationally or globally.

If you examine institutions that have been successful in developing online education applications, most derive their success from applications that relate directly to their missions and goals. They did not try to use online education to remake themselves into something totally different from their fundamental missions. There have been exceptions such as Southern New Hampshire University and Rio Salado Community College, both of which launched substantial new online programs enrolling tens of thousands of students. However, not all colleges seek to, or are able to, replicate their success. Colleges and universities should develop goals for online education just as they develop goals for any other activity appropriate to their mission. Participation in planning by stakeholders—especially faculty—is important. In sum, the goals for online education should fit the institution's mission and culture.

Online Education Applications

Online education applications are growing substantially every year. Converting what have historically been considered traditional, face-to-face courses into fully online courses has become commonplace. The development of completely online programs is being done on a more regular basis. Once a college or university has successfully developed a fully online course or program, the tendency is to develop more courses and programs until they have reached a saturation point. While student interest and demand can support online courses in just about any academic discipline, the same is not necessarily true for entire degree programs. Career-oriented subject areas such as business, computer science, and education generally are the more popular.

In addition to the fully online modality, there has been a clear and substantive acceptance of blended learning, particularly in traditional or mainstream higher education. The blended learning modality is perceived as the best of both learning modalities—face-to-face and online. Administrators, faculty, and students are supportive of initiatives in the blended format. Earlier this year, the results of a survey of American college presidents commissioned by *The Chronicle of Higher Education* indicated that an overwhelming majority of presidents—three quarters at private institutions and almost eighty percent at public campuses—believed blended courses that contain both face-to-face and online components will have a positive impact on higher education. (Selingo, 2014) However, blended learning has a nebulous quality because it defies any simple definition and comes in so many different forms and styles. The name "blended" is not universally accepted and we see the terms "hybrid," "mixed-mode," "web-enhanced," "mini-MOOC," and "flipped" to mean the same thing or some variation thereof. After the MOOC- hype subsided, the blended model was seen by some as their savior. In November 2013, Daphne Koller, a MOOC provider and founder of Coursera, commented at the Sloan Consortium's International Conference on Online Learning that students who have remediation and other learning needs and who lack the basic skills of reading, writing, and arithmetic would probably better be served by face-to-face instruction. (Koller, November 2013) Koller went on to say that MOOC companies should consider the development of more pedagogically sound course materials that can be used in blended online formats rather than fully online formats. In a sense, she was suggesting that Coursera and other MOOC providers might rebrand themselves as producers of high-quality content that gives faculty the option as how to best use their materials, rather than as fully online course providers and developers.

In addition to generic online and blended learning applications, additional online education applications might include:

1. Adding learning analytics software to a course management system to develop a student alert system;
2. Making greater use of social media software (blogs, wikis, Facebook, twitter) in existing online courses and programs;

3. Integrating mobile technologies into existing online courses and programs;
4. Creating or supporting a specific genre of courses (i.e., large lecture sections) with blended or "flipped" learning;
5. Adding adaptive learning software to a course management system to develop more personalized instruction environments;
6. Undertaking a blended learning initiative to support certain academic subject areas such as STEM or health sciences that have specific or more complex pedagogical needs.

It should be obvious that applications can vary significantly depending upon academic program needs, existing online education development, teacher readiness, student readiness, and instructional and student support services.

The Major Components of an Online Education Application

As seen in Figure 1, the major components of an online education application are: hardware, software, staffing/faculty development, facilities/student/tech support infrastructure, finances, and policies. These components are fundamental to every technology initiative and need to be considered if an online education application is to be successful. It is not feasible to cover each of these components in depth in an article of this size. In the following paragraphs, several current and important issues with respect to each component will be presented.

Hardware

The fundamental hardware required for online education applications is not particularly complex but should be consistent with the articulated strategic plan. Essentially it consists of servers that can support a network size appropriate for the institution. The network must also integrate with the hardware used for the institution's database management system as well as some type of course or learning management system. The vast majority of colleges and universities have established such a hardware facility in house or have contracted out with a service or cloud provider.

The hardware that the faculty and others involved with the online education application will have available to them also needs to be considered. Desktop computers are common but increasingly, the world has moved to mobile technology (i.e., laptops, tablets, smartphones). When launching an online education application, some thought should be given to supporting faculty acquisition of laptops. In many cases, faculty members already own laptops but it would be beneficial to make sure of this, and that the equipment is relatively up-to-date as well. In the earlier days of online education, it was quite common to incentivize faculty to use online technology by providing them with a free computer. For institutions that are just making the move to online education, this approach should be considered.

Software

The critical software for an online education application is a course management system (CMS)—also known as a learning management system (LMS). Many colleges have already acquired a CMS or have contracted with a vendor to host their applications. Blackboard, Canvas, and Desire2Learn are three dominant providers of this type of software. Moodle, a free, open source software platform, is also used by a number of colleges as their CMS. Regardless of the CMS a college chooses, it will require a good level of programming and systems support if installed in-house. A CMS needs to be integrated with the college's databases to allow for a graceful and efficient transfer of pertinent course and student data. It is critical that the CMS has a stable software environment and maybe a backup system since any serious or lengthy disruption can be disastrous for students and faculty.

An alternative to acquiring a CMS and developing online courses in-house is outsourcing course development to a third party vendor. Companies such as Pearson's Embanet—Compass Knowledge

Group, Bisk Education, and Colloquy provide a variety of support services including online course and program development. Several MOOC providers are also providing these services. While this might be an administratively easy way for a college or university to get started in online education, the costs can be significant. Before taking this approach, a careful cost-benefit analysis needs to be undertaken. An article entitled, "Colleges Finding Partners for Online Courses" that appeared in *University Business* provides a good overview of the issues associated with outsourcing online course development. (Finkel, 2013)

In addition to a basic CMS, specialized software for assessment, adaptive learning, learning analytics, and gaming might also be considered.

Staff/Faculty Development

A most significant issue in developing or expanding online education is the readiness and commitment of staff and faculty. Faculty "buy in" is particularly critical. In many colleges and universities, adjunct faculty teach the online courses because full-time faculty are unwilling or unable to do so. This is not the most desirable situation. Faculty resistance has been observed. Allen & Seaman (2012) in a national study of faculty attitudes reported:

> Faculty report being more pessimistic than optimistic about online learning. Professors, over all, cast a skeptical eye on the learning outcomes for online education. Nearly two-thirds say they believe that the learning outcomes for an online course are inferior or somewhat inferior to those for a comparable face-to-face course. (p. 2)

There is no silver bullet that will automatically change faculty attitudes. However, administrators need to engage and involve faculty in any plans and decisions that are important to the institution, including the development of online and blended learning. In some institutions, more and more faculty are teaching online, especially in blended formats, and there is no reason that an open discussion cannot be held about online education.

A fundamental characteristic of technology is that it changes, sometimes rapidly, and those using it will need on-going development if they are to be successful in its applications. While generic workshops and other training activities may suffice to initiate a professional development program, activities geared to certain types of instructional applications (i.e., large lecture sections, laboratory courses, math-based instruction) or disciplines may prove most beneficial in the long run. It is well recognized, for example, that how one teaches English literature is different from how one teaches chemistry or how one teaches social work. The pedagogical approaches are different as are the skills necessary to be successful teachers. Faculty, for example, who teach English literature may be excellent readers and writers with little facility for calculus. The opposite might be true of those who teach a laboratory science where a command of mathematical principles might be more beneficial. A recognition of the differences in teaching approaches, styles, and required skills should be considered as part of the planning for professional development. Shulman (1986) developed the *Technological Pedagogical Content Knowledge* framework that focuses on the need for the integration of the relationships among technology, pedagogy, and content knowledge to implement effective instructional technology applications. Readers might want to refer to Mishra & Koehler (2006) for a more recent review of this framework that is appropriate for the development of online education applications.

Characteristics of effective professional development include:

Pedagogical principles—start with the assumption that good pedagogy (i.e., social construction of knowledge, student interaction, instructor responsiveness) drive online learning technology.

Hands-on activities—participants need to use equipment and be allowed to experiment and make mistakes.

One-on-one coaching—group work is a good start but at some point faculty will need one-on-one assistance as they try different features.

Train the trainers—identify faculty in departments who have an interest in helping other faculty and provide them with assistance and release time so that they can be available to help other faculty.

Making sure that faculty have proper equipment – online education will require faculty to be available for student inquiries. While desktop computers are fine, laptops are far more convenient for teaching online.

Provide incentives—faculty new to online teaching deserve rewards for taking the time and effort to do so. Without a doubt, teaching online takes more time in preparation and teaching especially for beginners.

Start with smaller modules—to develop a fully online course may be daunting for someone who has never done so. It might be better to start with smaller modules rather than the entire course.

A good instructional design team is also critical for professional development and needs to be at the forefront of any faculty development effort. Investing in instructional design support services becomes a requirement for successful online and blended learning courses and programs.

Facilities/Student/Tech Infrastructure

In the early days of central computer centers, discussions of facilities and infrastructure generally referred to a single physical facility and the technical staff assigned to maintain it. The concept has changed considerably with the ubiquity of Internet technology. Faculty and students expect wi-fi service throughout a campus; staff provide "help desk" support and are available online. When developing online education applications, the concept of the help desk extends to all engaged faculty and students regardless of where they are. For online and blended learning courses, providing this support means assisting faculty in the development of online materials and assisting faculty and students using a CMS.

For fully online programs, the level of support infrastructure increases considerably. If a college expects to attract a wide audience or student base for fully online programs, then it must invest in a full gamut of academic, library, and support services. Academic advisement, admissions, financial processing, registration, library databases, and student counseling must be provided from afar via online and telephone help facilities. This can be a daunting proposition for colleges and universities launching their first fully-online programs. In fact, providing these services may be a more difficult undertaking than the development of the academic program. There are many cases where colleges have invested significantly into online program development only to find that the necessary support services have not been fully considered resulting in significant delays in implementation. If students are recruited across time zones, many of these services need to be provided on a twenty-four hour, seven-days-a-week schedule. While some colleges provide these services themselves, others are increasingly contracting with private companies for some or all of them. Successful fully online programs need good and reliable academic and student support services.

One of the most significant issues regarding facilities/infrastructure is the organizational placement of online education programs. This is especially the case with fully online programs. Generally, the choices come down to:

1. Centralizing online education in one specific department that takes on responsibility for development of programs, providing support services, contracting with faculty, recruitment, admissions, and registration, etc.

2. Integrating online education into existing academic department structures with coordination and oversight provided by an administrative officer.

Both approaches have been used and can be successful. The decision to centralize or not is similar to organizational decisions regarding for-credit adult and continuing education programs. Administrators need to consider carefully where fully online programs fit best in their organization. Regardless of which administrative avenue is chosen, individual online courses and blended learning courses generally are developed and maintained in existing academic departments.

Finances

The enthusiastic and creative discussions that take place in many planning processes center on the consideration of goals, objectives, and applications. However, the hard reality of finance can sometimes temper much of this enthusiasm. Online education initiatives require funding, and for institutions just embarking on them, the investment in software and support services can be significant. With the exception of colleges and universities with substantial endowments, much of higher education finds itself under serious financial constraints. Private colleges that are tuition-driven struggle to control costs and to maintain an affordable tuition rate. Publicly funded institutions also increasingly are relying on student contributions via tuition and fees as many states have significantly reduced if not abandoned their commitment to higher education. The U.S. General Accounting Office (2014) issued a report stating that an important milestone had been reached in 2012 when, for the first time in the history of our country, student tuition surpassed state appropriations for the financing of public higher education. In this section, several important financial considerations will be discussed.

First, an online education initiative may constitute a bold new program that addresses a specific need or an enhancement to an existing program. While the former case will likely require major new funding, the latter might be accomplished at modest incremental costs. In all cases, the newness, size, and scope of the initiative needs to be reviewed to determine its funding requirements. Each of the components (hardware, software, staff/faculty development, facilities/infrastructure, etc.) of the planning for a technology system's model should be considered. This is just part of good basic planning and not unique to online education.

Second, administrators should exercise caution if thinking about online education primarily as a way to substantially improve financial positions. While some colleges and universities have been able to realize significant profits from online education programs, many have not. In most cases, the revenue generated offsets costs. Colleges and universities that have made significant profits, and this includes for-profit colleges, have done so by using large numbers of adjunct faculty to teach in their online programs rather than full-time faculty. The possibility that offering fully online programs will create savings in brick and mortar facilities might also be tempting to some, but the number of documented cases—especially for colleges and universities that have already substantial physical campuses—are few and far between. On the other hand, institutions that rent off-campus centers for continuing, adult, and other types of special programs might find an online education program to be a cost-beneficial way to offer services without paying part of or all of the fees related to rent costs.

Third, for those institutions planning on contracting for hosting, course/program development, or support services, a careful analysis must be undertaken. Finkel (2013) references the experiences of Goodlett McDaniel, associate provost of distance education at George Mason University, which contracted with Colloquy to develop an online MBA program:

> In McDaniel's experience, vendors will sometimes "over-promise and under-deliver" results to higher ed administrators who don't have significant business world experience. "There can be a natural tendency to be excited and think that all of their problems will be solved by the contract," he says. Administrators should check companies' references, pay close attention to the revenue

split, and make sure the length of the contract seems right, with an "out-clause" if the school thinks it might need one. (Finkel, 2013)

This sound advice should be heeded. Contract services are not panaceas that will make "all the problems" go away, so the costs and benefits of this approach will require careful analysis.

Fourth, in order to incentivize academic departments and full-time faculty to become active players in the development of online education, especially fully online programs, administrators might consider establishing a revenue sharing policy in which a percentage of the income derived from the online program is returned to the academic departments. This has worked successfully in a number of institutions. On the other hand, it opens up a number of issues related to precedence that many administrators would rather avoid. This is especially true in public institutions where budget and revenue processes may need to comply with state policies. It can, however, work well where self-supporting activities are allowed (as in the case of private and for-profit institutions).

Lastly, colleges and universities could also consider instituting an additional fee per credit hour to offset costs associated with developing and supporting online courses. Precedence for this were set in the 1980s and 1990s when a number of colleges established student technology fees to fund instructional hardware, software, and support services.

Policies

The last component of the planning model is the consideration of any policy issues that may arise as a result of a new or substantial expansion of online education. Existing bylaws, governance documents, and collective bargaining contracts need to be reviewed to insure that institutional policies related to curriculum approval, workload, intellectual property, accreditation compliance, faculty observations and evaluation are not being bypassed or infringed upon. If a college has already developed a substantial online program, many of these policy issues may have already been addressed. Those colleges mounting new initiatives would be wise to consult their legal, procurement, and personnel offices for a review of policies that might relate to online education.

Where there are strong faculty governance bodies and/or collective bargaining agencies, administrators would be wise to understand their prerogatives in mounting online education initiatives. In many cases, the mounting of such programs falls into grey areas. The rollout of MOOC courses at San Jose State University provides a good example. After the announcement of a contract award to Udacity for the development of MOOC courses, faculty governance leaders raised a number of objections and concerns. As described in *The Chronicle of Higher Education*, faculty governance leaders passed a resolution asking the chancellor of the California State University system to review governance policies at the university because of the way the contract was awarded and because of a number of "communication and transparency issues." In addition, San Jose's Academic Senate developed a policy proposal that would clarify the rules governing the development of "technology intensive, hybrid, and online courses and programs" at the university (Kolowich, 2013). As a result, in July 2013, San Jose State University put the entire MOOC initiative with Udacity on hold. Without going into all of the details of the failed MOOC experiment at San Jose State University, it is apparent that consultation with the Academic Senate on the awarding of the contract was minimal or non-existent. The Academic Senate reacted strongly against the administration, citing policy issues related to consultation. The experience at San Jose is an excellent policy lesson and one that should be studied by college administrators who are tempted to bypass faculty governance when developing academic initiatives.

In addition to in-house policies, institutions need to be aware of external compliance issues. Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990 are major federal legislative policies designed to protect the civil rights of individuals with disabilities. The intent of these two laws is to prevent any form of discrimination against individuals with disabilities.

Section 504 applies to entities that receive federal funds, and the ADA applies to virtually every entity except churches and private clubs. In designing online education material, there needs to be an awareness that the designs are in compliance with Section 504 and the ADA. Most major course management systems make provisions for this compliance, but administrators should be aware that they exist and that instructional design staff and faculty are aware also. The National Center for Accessible Instructional Materials (see: http://aim.cast.org/learn/post-secondary/higher_ed#.VLEH9nt9ZbA) provides excellent resources regarding compliance issues with Section 504 and ADA.

Special accreditation requirements, especially for fully-online programs, may be needed depending upon the college or university accrediting body. Administrators should consult with a regional accreditor to determine its requirements for fully-online programs.

Lastly, a review of copyright infringement laws are in order when developing or expanding online education. The facility with which the Internet makes it possible to copy and paste and to download files and media have made many institutions vulnerable to copyright infringement. In addition, having materials online and open to the public also makes it easier for infringement to be detected by copyright owners. Instructional designers and faculty need to be aware of what is allowed before a copyright infringement occurs and to make sure that online materials are in compliance.

For further information, New York University's Faculty Resource Network has an excellent paper on copyright issues related to online education and can be accessed at: http://www.nyu.edu/frn/publications/millennial.student/Copyright.html.

Evaluation

Evaluation and feedback are critical for continuing planning activities from year to year and from planning cycle to planning cycle. All planning participants need to know if and how well the online education applications are achieving objectives. Several principles of good evaluation as applied to online education are worth a discussion.

First, evaluation criteria that relate to the goals and objectives of the online education application must be established. For example, if a goal or objective was to improve teaching and learning, then criteria appropriate to evaluating instruction such as student assessments are appropriate. If a goal or objective was to increase student engagement, then student satisfaction criteria are appropriate. If a goal or objective was to provide greater access to an education, then enrollment patterns and retention criteria are appropriate.

Second, the data capture capabilities of online and blended learning have opened up entire new areas of evaluation that can focus not only on common instructional criteria (tests, grades, retention, student and faculty satisfaction) but also on the uniqueness and subtlety of a course or program. Because so many instructional transactions are captured electronically on discussion boards, blogs, and wikis, a plethora of data is available for evaluation and analysis. Discourse and content analysis of student transactions and course postings can delve much deeper into what students are doing and learning in an online class than is possible in the face-to-face modality. Simply put, the data is there in electronic form and ready for analysis. One caution is that attention should be paid to any possible infringement to the Family Educational Rights and Policy Act (FERPA) which was enacted by Congress to protect the privacy of students.

Third, the evaluation of faculty experiences are as important as student experiences. Faculty, who are successful in their teaching, whether online or on-ground, welcome evaluation and learn how to become better teachers from it. Faculty satisfaction surveys provide valuable insights into successful online education development and implementation. Data from these surveys should be shared widely with faculty and instructional designers.

Fourth, evaluation should not be strictly summative where it occurs towards the end of an activity but should be formative and allow for improvements and adjustments as needed. Evaluation benchmarks should be included in the plan at appropriate points so as to refine the development process.

Lastly, evaluation provides feedback in an iterative, continuous planning process and should not serve as the process's endpoint. Evaluation results inform future planning activities. Successes as well as problems in the planning activity development should be documented and shared. In this way, evaluation is a beginning and can help initiate the next planning cycle's activities.

Online Education, Planning, and American Higher Education

It should be obvious that this article's emphasis on careful deliberate planning would be counter to the notion that higher education needs disruption and radical transformation. Clayton Christensen (1997), who is credited with coining the term "disruptive innovation," originally applied the concept to corporate America. More recently, he has applied the term to non-profit entities including higher education (Christensen & Eyring, 2011). However, corporate America has a very different culture based on profit-motive and intense competition. It is an environment encompassing in excess of 18 million companies incorporated in the United States alone according to DMDatabase.com (see http://dmdatabases.com/databases/business-mailing-lists/how-many-businesses). American higher education includes no more than 5,000-6,000 postsecondary institutions including many small proprietary colleges. The culture of American higher education is not profit driven nor is it based on intense competition. More people are attending college and more are pursuing graduate degrees and life-long learning opportunities than ever before. In addition, higher education's culture has been one of serving the public good and not simply generating revenue. I respectfully disagree with Christensen and do not believe that the disruption approach is needed. In fact, I believe it may do more harm than good in most colleges and universities. I am also concerned that the term has become a rallying cry for neoliberal ideologues who feel they must disparage an institution in order to promote radical change. David Harvey (2005)—in his seminal work on the history of neoliberalism—cautioned that a common tactic within this movement has been what he calls "creative destruction" that builds a narrative that calls for destroying institutional frameworks and values in order to make way for a market mentality based on competition and profit maximization. It would not be beneficial for the majority of colleges and universities to change their values for the sake of increasing revenue nor do they have to in order to adopt or expand online education.

Bynre (2014) in an article entitled, *Why Clayton Christensen is wrong (and Michael Porter is right)*?, reaches a similar conclusion with respect to the online education initiatives of the Harvard Business School. The beginning of this article cited an unsuccessful initiative at the University of Illinois to make readers aware of the problems that can occur when administrators deliberately or mistakenly attempt to rush into online education without proper planning and implementation. There are many fine online and blended learning initiatives throughout higher education that are exemplars of good planning and implementation including the Penn State World Campus, the University of Central Florida, the University of Illinois—Springfield, the City University of New York School of Professional Studies, the State University of New York Learning Network (now Open SUNY), the University of Wisconsin—Milwaukee, the University of Nebraska, and others. The online education programs in these schools evolved over a number of years and did not require or cause massive or sudden disruption in the institution's normal planning processes.

The United States has had the highest ranked higher education system in the world for a number of years according to several organizations such as the Times Higher Education World Ranking System and Universitas (based in the United Kingdom). While education ranking systems can be questioned, they do provide some indication that things are not all wrong in American colleges and universities and are possibly quite good. Nevertheless, other countries are pouring significant resources into their higher

education systems at a time when the United States is withdrawing its support. For the first time in its history, the majority of funding for public higher education in this country comes not from states but from student tuition. In addition, the private non-profits, especially those that are tuition-driven with limited endowments, are already beginning to compete rigorously for students. This competition will accelerate in the years to come. President Barak Obama's proposal in January 2015, calling for free tuition to community college students, if it comes to pass, will have significant ramifications for all of our colleges and universities. For American higher education to maintain its prominence in the world community, it will need to continue to evolve and develop its academic programs and services to its students, communities, and society. Its evolution will be dependent upon careful purposeful planning. Instructional technology and online education have a definite and important role to play in this endeavor.

About the Author

Anthony G. Picciano is a professor and executive officer in the Ph.D. Program in Urban Education at the Graduate Center of the City University of New York. He is also a member of the faculty in the graduate program in Education Leadership at Hunter College, and the doctoral certificate program in Interactive Pedagogy and Technology at the City University of New York Graduate Center. He has extensive experience in education administration and teaching, and has been involved in a number of major grants from the U.S. Department of Education, the National Science Foundation, IBM, and the Alfred P. Sloan Foundation. In 1998, Dr. Picciano co-founded CUNY Online, a multi-million dollar initiative funded by the Alfred P. Sloan Foundation that provides support services to faculty using the Internet for course development. He was a founding member and continues to serve on the Board of Directors of the Online Learning Consortium (formerly The Sloan Consortium).

Dr. Picciano's major research interests are school leadership, education policy, online teaching and learning, data-driven decision making, and multimedia instructional models. Dr. Picciano has conducted three major national studies with Jeff Seaman on the extent and nature of online and blended learning in American K-12 school districts. He has authored or edited numerous articles and books including *Educational Leadership and Planning for Technology, 5th Edition* (2010, Pearson), *Data-Driven Decision Making for Effective School Leadership* (2006, Pearson), *Distance Learning: Making Connections across Virtual Space and Time* (2001, Pearson), *and Educational Research Primer (2004, Continuum)*. In 2012, he published *The Great American Education-Industrial Complex: Ideology, Technology, and Profit*, (Routledge) with Joel Spring. In 2007, he co-edited *Blended Learning: Research Perspectives* with Chuck Dziuban and in 2014, published a new version of this book entitled, *Blended Learning: Research Perspectives, Volume 2* (Taylor/Francis). He is currently working on a new book project with Chuck Dziuban, Charles Graham, and Patsy Moskal entitled, *Conducting Research in Online and Blended Learning Environments*: *New Pedagogical Frontiers*

In 2010, Dr. Picciano received the Sloan Consortium's National Award for Outstanding Achievement in Online Education by an Individual.

References

Adams, D. (1987). Paradigmatic contexts of models of educational planning and decision making. *Educational Planning, 6*1), 36-47.

Allen, E & Seaman, J. (2014). *Grade change: tracking online education in the United States*. Needham, MA: Babson College Survey Research Group.

Allen, E & Seaman, J. (2012). *Conflicted: faculty and online education*, 2012. Needham, MA: Babson College Survey Research Group.

Barnard, C. I. (1964). *The functions of the executive*. Cambridge, MA: Harvard University Press.

Bynre (June 14, 2014). Why Clayton Christensen is wrong (and Michael Porter is right)? *Poets & Quants.* Retrieved from: http://www.beatthegmat.com/mba/2014/06/14/why-clayton-christensen-is-wrong-and-michael-porter-is-right Accessed: March 20, 2015.

Chafkin, M. (December 2013). Udacity's Sebastian Thrun, godfather of free online education, changes course. *Fast Company.* Retrieved December 1, 2014 from: http://www.fastcompany.com/3021473/udacity-sebastian-thrun-uphill-climb

Christensen, C. M. & Eyring, H.J. (2011). *The innovator's university: Changing the DNA of higher education from the inside out.* San Francisco: Jossey-Bass.

Christensen, C. M. (1997). *The innovator's dilemma.* New York: HarperCollins.

Collins, E.D. (September 2013). *Preliminary summary: SJSU and augmented online learning environment pilot project.* The Research and Planning Group for California Community Colleges (RP Group).

Collis, B & van der Wende, M (Eds.) (2002). *Models of technology and change in higher education: An international comparative survey on the current and future use of ICT in Higher Education.* Enschede: The Netherlands: Center for Higher Education Policy Studies, University of Twente. Retrieved from: http://doc.utwente.nl/44610/1/ictrapport.pdf

Des Garennes, C. (April 22, 2012). Lessons from an $18 million Global Campus failure. *The News Gazette*. Retrieved January 3, 2015 from:http://www.news-gazette.com/news/local/2012-04-22/lessons-18-million-global-campus-failure.html

Etzioni, A. (1961).*A comparative analysis of complex organizations* New York: Free Press.

Finkel, E. (June 2013). Colleges finding partners for online coursed. *University Business*. Retrieved January 8, 2015 from: http://www.universitybusiness.com/designingdigital

Fullan, M. (2001). Leading in a culture of change. San Francisco: Jossey-Bass.

Harvey, D. (2005). A brief history of neoliberalism. New York: Oxford University Press.

Kanter, R. M. (1999). The enduring skills of change leaders. *Leader to Leader*, *13*(Summer), 1522.

Kolowich, S. (November 19, 2013). Citing series of conflicts, San Jose State U. asks for governance review. *The Chronicle of Higher Education*. Retrieved on January 10, 2015: *http://chronicle.com/blogs/wiredcampus/citing-series-of-conflicts-san-jose-state-u-asks-for-governance-review/48427?cid=wc&utm_source=wc&utm_medium=en*

Kolowich, S. (September 3, 2009). What doomed the global campus? *Inside Education*. Retrieved from https://www.insidehighered.com/news/2009/09/03/globalcampus

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017-1054.

Parsons, T. 1958). Some ingredients of a general theory of formal organization. In A. W. Halpin (Ed.), *Administrative theory in education* (pp. 40–72). Chicago: University of Chicago Press.

Selingo, J.J. (2014). The innovative university: What college presidents think about change in American higher education. *The Chronicle of Higher Education.*

Senge, P. (2006). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(4).

Simon, H. A. (1960).*The new science of management decision*. New York: Harper & Row.

Simon, H. A. (1982). *Models of bounded rationality*. Cambridge, MA: MIT Press.

U.S. General Accounting Office (December 2014). State funding trends and policies on affordability: Report to the Chairman, Committee on Health, Education, Labor, and Pensions, United States Senate. Report No. GAO-15-151U. Retrieved January 8, 2105 from: http://www.gao.gov/assets/670/667557.pdf

Wenger, E. 2000). *Communities of practice: learning, meaning, and identity*. Cambridge: Cambridge University Press.

Are There Metrics for MOOCS From Social Media?

Alan Ruby, Laura Perna, Robert Boruch, and Nicole Wang

University of Pennsylvania

Abstract

Since "the year of the MOOC" in 2012, the effectiveness of massive open online courses (MOOCs) has been widely debated. Some argue that MOOCs are not an effective mode of instructional delivery because of low completion rates. In the interest of developing alternative indicators of performance this study draws from recent efforts to measure engagement in social media, as well as from research on indicators of student engagement in traditional college courses. Using data from 16 Coursera MOOCs offered by the University of Pennsylvania we calculate standardized access rates for lectures and assessments. While these indicators have clear limitations as measures of educational progress they offer a different, more nuanced understanding of the level and nature of users' engagement with a MOOC. This paper shows that a very small share of users takes up available opportunities to access course content but notes that the standardized access rates compare favorably with those for social media sites and with response rates to large-scale direct mail marketing programs. For MOOC providers and platform managers, indicators like the ones developed in this study may be a useful first step in monitoring the extent to which different types and combinations of activities may be providing better opportunities for learning.

Introduction

Since "the year of the MOOC" in 2012, the effectiveness of massive open online courses (MOOCs) has been widely debated. Some argue that MOOCs are not an effective mode of instructional delivery because of low completion rates. For example Perna et al. (2014) found fewer than 10% of those registered for "first-generation" MOOCs at the University of Pennsylvania completed the course. Completion rates were low, regardless of whether users followed the instructor's suggested pattern of

experiences or chose the order to access learning materials. Other studies have reported similarly low completion rates (e.g., MOOCs @Edinburgh Group, 2013; Ho et al., 2014).

Using completion rates to gauge performance is consistent with conventional approaches to quantifying student behavior in a course of study. Enrollment, progress, and completion were commonly measured characteristics of early models of education systems (Stone, 1970; King, 1972) and enrollment and progress data recur in the OECD's *Education at a Glance* (OECD, 2014) statistical series.

Completion of a course is only a partial indicator of a MOOCs' performance or student outcomes. Some advocates, such as Koller et al. (2013), stress low completion rates can still result in large numbers of beneficiaries, given the very high number of users who register for a course. Moreover, completion may not be a MOOC user's goal (Koller et al., 2013) and focusing on completion could obscure the possibility that intermittent interaction with a MOOC may produce user benefits (Haggard, 2013; Ho et al., 2014). Conventional indicators of progress may be "ill-suited" to the environment or course design of a MOOC (Hoffman and Fodor, 2010, p. 42), as MOOCs allow episodic and partial involvement as well as ordered and sequential movement within a course.

Recognizing that measures of completion are "fairly blunt instruments when it comes to making sense of student interaction, engagement and learning," Coffrin et al. (2014, p. 85) focused on identifying categories of users in MOOCs, based on users' levels of engagement in course content. Their analyses revealed three categories of users: "auditors"—those who watch content but do not do assessments; "active" learners—those who completed at least one assessment; and "qualified" learners—those who watched content, completed an assessment, and scored well. This effort to categorize users in MOOCs aligns with attempts to sort social media users along a continuum of "visitors," i.e., those who see the Internet as a tool, and "residents," those who use the internet as a social space (Wright et al., 2013; White and Le Cornu, 2010).

This study explores patterns of engagement in MOOCs, drawing from efforts to measure engagement in social media, as well as from research on indicators of student engagement in MOOCs and traditional college courses. In particular, our interest is in creating a measure of the rate of taking up MOOC learning opportunities that is easy to calculate and interpret. We explore the utility of several potential indicators of engagement in a MOOC by using data from 16 Coursera MOOCs offered by the University of Pennsylvania.

Indicators of engagement akin to those used in social media may be useful because of similarities between MOOCs and social media sites. For instance, MOOCS and social media use "web based technologies to create…interactive platforms via which individuals and communities share…(c)o-create, discuss and (possibly) modify…content" (Keitzmann et al., 2011, p. 241). The technology on which MOOCs and social media sites depend makes communication among users easy and inexpensive. Both MOOCs and social media sites are usually freely accessible and allow users to access the sites when they wish; the user controls the duration, rate, frequency and order of interactions. Both offer opportunities for different levels of activity allowing users to exchange information and view, manipulate and create content. Both put a premium on reaching large numbers of people and retaining their interest.

Social media sites can be thought of as learning environments or "passionate affinity spaces" (Gee and Hayes, 2011, p.69) where people with shared interests exchange ideas and information freely, regardless of prior experience and expertise, age, gender, location or wealth (Gee 2013a, p. 175). Social media sites use a "participation metaphor" (Sfard 1998, p. 6) of learning and engagement where the goal is community building and the emphasis is on belonging to the group and participating in its activities. While the Coursera MOOCs share some of the characteristics of affinity spaces, many of the courses we study emphasized individuals as recipients of content provided by experts with a goal of mastery, more akin to Sfard's metaphor of learning as acquisition (p. 7). Some courses like Modern Poetry (MoPo)

placed great weight on participation, peer review, collegiality and exchange. As Sfard argues there is a "case for the plurality of metaphors" (p.11) and, when the technology is still evolving, as in the case of MOOCs and measurement of MOOC effectiveness, exploring activity measures like those used by social media is a potentially fertile field of inquiry.

Engagement

The literature on engagement and learning illustrates the complexity of these constructs. Azevedo (2015) points to the scope and diversity of approaches to delineating and quantifying engagement. In his commentary on six articles representing "the various theoretical, methodological, and analytical challenges," Azevedo begins by declaring that "engagement is one of the most widely misused and over-generalized constructs" (p. 84). Azevedo concludes by arguing for greater attention to "process data" as this "will lead to advances in models…analytical techniques and…instructional recommendations" (p. 93).

Reflecting an interest in process, higher education institutions commonly emphasize "engagement" as a mechanism for improving the college experience and increasing graduation rates (see Price & Tovar, 2014). Attention to engagement is grounded in the work of scholars such as Tinto (1975, 1987), Astin (1984) and Kuh and his colleagues (2006) who identify behaviors that arguably enhance learning. Engagement, for example, can be defined as the "time and effort students devote to activities that are empirically linked to desired outcomes…and what institutions do to induce" participation in these activities (Kuh, 2009b, p. 683). Engagement is assumed to be a key mechanism for promoting learning as it "builds the foundation of skills and dispositions that people need to live a productive satisfying life" (Kuh, 2009a, p. 5). It includes interactions with learning materials, other learners, faculty, and co-curricular activities.

Student engagement research often focuses on on-campus and face-to-face instructional activities but some scholars have considered the relationship between engagement and outcomes in on-line courses (Coates, 2007; Chen, Gonyea, & Kuh, 2008; Robinson & Hullinger, 2008), in learning management systems (Beer et al., 2010) and in social networks (Thoms and Eryilmaz, 2014). As an example, Robinson and Hullinger (2008) used a version of the National Survey of Student Engagement (NSSE) to explore variations in engagement of students enrolled in at least one completely on-line course. The results suggest variations in engagement are associated with students' academic performance, academic major, and age, and faculty creating "purposeful course designs that promote interaction, participation, and communication in the online learning environment" (Robinson & Hullinger, 2008, p.107).

Although measured much more simply than in on-line or e-learning environments, engagement is also a key criterion for assessing the effectiveness of social media sites as marketing tools (Social Bakers, 2013). Each visit to a site or a page is an engagement, for instance, and represents an opportunity to place new content before a potential purchaser. This type of engagement measure is used to assess the effectiveness of marketing strategies for products as diverse as luxury shoes (PR newswire, 2013) and furniture (French, 2012).

Although social media networks offer different opportunities for engagement (Dunham, 2014), many use a common approach to assess engagement. The goal is capturing consumer actions and behaviors beyond the simple act of viewing content (Hollebeek, Glynn & Brodie, 2014). These approaches assume that success on social media platforms like Facebook is "not primarily a matter of amount of fans." Activity is more important: "likes, comments and shares are the fuel of vitality" (Eyl, 2013, p. 1). User engagement with content on a social media site is "likely to generate commitment," brand loyalty, and repeat business (Hoffman & Fodor 2010, p. 46.)

Typically, approaches to measuring engagement in social media aggregate the number of "Likes," "Posts," and "Shares," or things like replies on Twitter and comments on LinkedIn and Instagram, for a specific period. This number is then related to the number of followers or fans during the same period. Averaging these rates across days or weeks produces a "mean engagement rate." Calculating activity per user, for instance, recognizes the dynamic nature of social media and is an indicator of how many people are "connecting with your brand and how often" and how many times they draw attention of others to the content or item (Ken, 2014, p. 2).

Engagements rates make it easier to understand the large and complex activity of many social media sites, partly by sifting out one-time visitors and passive followers. In an analysis of more than 4.9 million posts over three months on 60,000 Facebook pages, Eyl (2013) found most sites have "very low" engagement rates. Half of all sites had rates of "0.002 interactions per fan per day." In essence, engagement rates in social media are the sum of individuals' discrete actions that change a screen view, standardized to some measure of the population. This standardization allows comparisons of engagement rates between courses or segments of courses.

While there is a commercial driver behind much of the attention to engagement rates in social media settings, the activities measured are essentially acts of participation, with the user doing something in relation to content on a site. This approach echoes Sfard's (1998) idea of seeing learning in terms of "participation," as individual "learners contribute to the existence and functioning of a community of practitioners" (p. 6). It also indicates how large numbers of individuals organize or "self-regulate" learning activities which "is of particular importance in relatively open learning environments…where learning is enhanced by digital technologies" (Steffens, 2015, p. 49).

Applying Engagement Rates to MOOCS

Measures of engagement in social media are less sophisticated than measures that have been developed to understand engagement in on-campus courses and some on-line courses. Nonetheless, applying the basic notions of social media engagement metrics to MOOCs may provide useful insights into the activities of MOOC users. The first generation of Coursera MOOCs was usually neither credit-bearing nor credentialed. They were less formal learning environments with flexibility in terms of time spent or required, order and rate of progress through materials, and involvement in assessment activities. As such, they are akin to the largely informal online learning environments like social media sites and digital games and fan sites which "connect playing and learning to social interaction and mentoring" (Gee, 2013b, p.18). Although MOOCs use formal, frequently didactic, instructional methods, they operate sufficiently like fully informal environments like Facebook or Instagram to make the use of social media metrics worth exploring.

This study answers the question: how often do users access content, be it a course lecture, a quiz, or another assessment? Applying measures from social media to address this question accommodates asynchronous access and differences in an individual's intentions. It also places user behavior at the heart of understanding the extent to which users access large-scale open online course content. This study does not classify users into "types," assuming that users may behave differently at different times and circumstances. In this study, the access rate quantifies the act of opening a lecture or quiz, activities that precede and may presage learning. We call these measures 'access rates' to avoid inferring any user behavior beyond the act of opening a page view. We are measuring the frequency of a basic activity, how often the individual's screen view changes, that is a precursor to constructive and interactive learning activities like generating something that is not in the material presented or confirming or debating another's proposition (Chi 2009, pp.77-83)

.

An Example: Access Rates for Penn's First-Generation Coursera Offerings

We used this approach to examine user access in 16 Coursera courses taught for the first time by faculty at the University of Pennsylvania between June 2012 and July 2013. The courses varied in field of study, design, length and number of access opportunities.

We consider the extent to which users access four types of instructional materials: lectures; quizzes embedded in lectures; stand-alone quizzes; and open-ended questions. Our approach gives equal weight to different activities—that is, accessing a lecture counts the same as responding to an open-ended question or attempting a multiple-choice quiz. This approach avoids making assumptions about the type of activity that "best" promotes learning in an online environment although Chi's (2009) taxonomy of active, constructive and interactive learning suggests simply viewing a lecture is a less engaged activity as compared to identifying the right answer or creating original text. We do not consider activities such as posting a message to a discussion forum, as Coursera did not provide us with access to these data and because of challenges associated with interpreting these data (as discussed by Brinton et al., 2013). We focus instead on exploring indicators of engagement that instructors can easily adopt and that can be replicated across large numbers of courses at little cost. We do not perform statistical tests as the analyses describe data from the population, not a sample. Moreover, with the high number of cases in the analyses, all statistical tests would be statistically significant.

Two Indicators of User Activity

In what follows we use two indicators, one that is aggregated across the 16 courses and one that pertains to each course separately. The first indicator, *access rate per user*, is the sum of the number of times a user accessed any of the four types of activities offered in the course, divided by the number of users. We define a user as someone who registers for a course between the dates a course opens and two months after the course ended. This indicator recognizes that a user may access a lecture and some assessments multiple times.

The second indicator, *the standardized access rate*, adjusts for the number of different access opportunities a course offers. The rate is calculated as the number of accesses per user divided by the number of access opportunities offered. The denominator is effectively the number of "person-opportunities" akin to "person-years" or "disability adjusted life-years" used by health economists and epidemiologists for over 30 years (Kromann, & Green, 1980; Anand, & Hanson, 1997; Bhupathiraju et al., 2014). The standardized access rate sums all of the chances a person has to learn or at least look at new content in a course.

Penn Course Access Rates

Table 1 (next page) shows that, across the 16 courses, more than 710,000 users had just over 1,100 opportunities to access lectures, stand-alone quizzes, embedded quizzes and open-ended questions. Users took up these opportunities nearly 13 million times. Of the nearly 13 million access behaviors more than 9.2 million were tied to lectures and nearly 3.7 million were tied to assessments.

Across the 16 courses, a given user accessed content an average of 18.2 times. The access rate for lectures (13 per user) is higher than the access rate for assessments (5.2 per user). Access rates also vary by type of assessment. The rate falls from 3.4 accesses per user for quizzes embedded in lectures, to 1.6 for standalone quizzes, to 0.2 for open-ended questions.

Table 1. Access Rates Aggregated Across Courses.

Opportunities	Number of Registrants (A)	Number of Times Accessed (B)	Access Rate (B) / (A)	Number of Access Opportunities (C)	Standardized Access Rate [(B / A) / C]
Registrants	710,385				
Total		12,946,959	18.2	1,131	0.016
Lectures		9,251,884	13.0	718	0.018
Assessments		3,695,075	5.2	413	0.013
Total Assessments		3,695,075	5.2	413	0.013
Embedded quiz		2,439,680	3.4	186	0.018
Standalone quiz		1,127,228	1.6	171	0.009
Open-ended question		128,167	0.2	56	0.003

While interesting, these rates do not take into account the number of instructor-created access opportunities in a course. To control for this variation, Table 1 also shows the "standardized access rate." Across all opportunities, the standardized access rate averages 0.016. The standardized access rate is somewhat higher for lectures (0.018) than for assessments (0.013). The standardized access rate also varies based on type of assessment, falling from 0.018 for quizzes that are embedded in lectures, to 0.009 for stand-alone quizzes, to 0.003 for open-ended questions. The standardized lecture access rate (0.018) is roughly equivalent to the 2% average response rate for direct mail advertising sent to individuals (DMA 2012 & Yoon & Eckels 2013).

These aggregate numbers mask variations across courses. Table 2 (next page) shows that the average number of times a user accessed course content (that is, the access rate) varies across the courses by a factor of 5, ranging from a low of 7.3 in Rationing and Allocating Scarce Medical Resources to 35.4 in Gamification.

The average number of times a user accesses course content is not tied to the number of access opportunities. Five courses have 100 or more access opportunities (Gamification, Microeconomics, Calculus, Mythology, and Modern Poetry) but the access rates for these courses vary from 15.6 to 35.4. Among the seven courses with fewer than 50 access opportunities, access rates range from 7.3 to 24.8. Gamification and Modern Poetry have the same number (100) of opportunities, but Gamification has a much higher access rate (35.4 per user) than Modern Poetry (15.6). When we adjust access rates for the number of access opportunities, we continue to see considerable variation across courses. Table 2 shows standardized access rates ranging from 0.12 in Calculus and 0.14 in Genome Science to more than 0.6 in ADHD, Vaccines, and Pharmacy 101. The five-fold difference between the lowest and the highest standardized access rates is important because it shows that some courses engage learners more than others. There may be some instructional design choices that produce courses that engage learners more than others. These choices (preferred length of video or type of assessment, for example) could be revealed by more focused research within the highest and lowest rating courses. Our set of courses is too small and too different in design, length, audience, content and degree of difficulty to allow us to identify patterns or draw conclusions about the instructional choices that produce the greatest engagement.

Table 2. Access Rate for Each Course

Course	Number of Registrants (A)	Number of Times Accessed (B)	Access (B) / Users (A)	Number of Opportunities (C)	Standardized Access Rate [(B / A) / C]	Lecture Completion Rate
Gamification	83,061	2,942,781	35.4	100	0.35	18%
ADHD	25,995	645,180	24.8	36	0.69	15%
Operations	99,451	2,009,708	20.2	94	0.21	
MicroEcon	35,460	703,307	19.8	123	0.16	7%
Health Policy	30,592	562,686	18.4	42	0.44	10%
Vaccines	20,689	365,257	17.7	28	0.63	14%
Calculus	58,170	981,037	16.9	141	0.12	6%
Myth	63,545	1,042,949	16.4	109	0.15	7%
World Music	35,132	566,101	16.1	73	0.22	6%
ModPo	39,654	617,055	15.6	100	0.16	6%
Pharm101	24,582	370,331	15.1	23	0.66	
Design	46,241	693,331	15.0	78	0.19	8%
Cardiac	44,168	647,433	14.7	41	0.36	14%
Networks	45,681	452,757	9.9	48	0.21	13%
Genome Science	33,154	251,593	7.6	55	0.14	
Rationing	13,228	96,171	7.3	40	0.18	7%

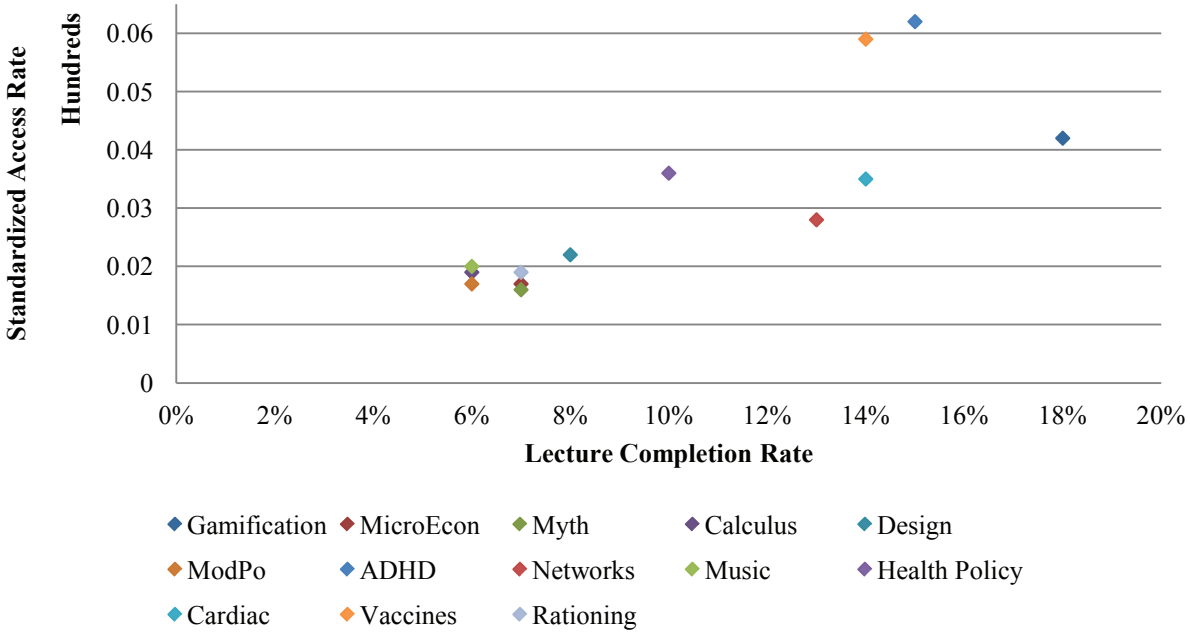
Access or Completion?

Access rates offer a different view of the potential educational benefits of courses than completion rates. In earlier work with this same group of MOOCs, we speculated that relatively low completion rates may reflect, in part, user "curiosity, browsing and lack of interest or motivation to complete" (Perna et al., 2014). We calculated completion rates for populations of "registrants," those who signed up for the course when it opened and at any point up until two months after the last course component was released.[1] We defined completion rates as the percentage of registrants accessing a lecture in the last week or module of a course and refer to them as "lecture completion rates" to distinguish them from completion rates of assessment activities.

[1] Refer to Perna et al (2014), for a complete description of the procedures used to define registrants and calculate lecture completion rates. For example, a registrant is a person who signed up for the course when opened and at any point up until two months after the last course component was released.

Comparing standardized access rates with completion rates for lectures for the 13 courses with available data[2] reveals a relationship between the two measures, albeit with some variability (see Figure 1). The generally positive relationship in Figure 1 is consistent with the assumption that 'engagement' (as measured here by standardized access rates) is positively related to completion. The implication is that standardized access rates can predict completion rates especially when the access rates are low. This relationship is illustrated by the clustering of low access and completion rates in the bottom left corner of Figure 1. As access rates increase, completion rates also increase but with greater variability as evidenced by the spread in the upper right quartile of Figure 1. But there is still a clear relationship between access and completion, as the correlation between access and completion rates is 0.81. If one were to construe the obtained correlation as being from a sample of some hypothetical population (rather the entire population), the correlation would be statistically significant (different from zero) at the alpha=.001 level or less.

Figure 1: Standardized Lecture Access and Lecture Completion Rates by Course



Discussion

The data show that a very small share of users takes up available opportunities to access course content. The standardized access rates used here compare favorably with those cited for many social media sites (e.g., Eyl, 2013) and with response rates to large-scale direct mail marketing programs (DMA, 2012). These results suggest MOOCs—at least in the form examined in this study—are operating like the

[2] We have lecture completion rates for thirteen of the sixteen courses. For three courses it was not possible to determine which lecture was the last in the sequence. See Perna et al (2014) for a more complete discussion of the implications of the available data for measurement of completion and other aspects of the analyses.

informal environments of such social media sites as Facebook and Instagram despite the presence of more formal instructional methods.

The indicators of access in this study have clear limitations as measures of engagement in effective educational practices or educational progress. They do not measure learning, length of time spent on an activity, or other potentially useful dimensions of a user's experience with any set of content or assignment. They do not differentiate single and multiple views of the same material. They also do not take into account differences in course length or difficulty, or the quality of lecture presentation and assessment design. Nonetheless, by assessing the extent to which users are accessing course content rather than completing a course, access rates offer a different, more nuanced understanding of the level and nature of user engagement with a MOOC.

Although crude, these indicators of access proposed and used here also offer insights into how large numbers of users respond to different types of opportunities to engage with various forms of course content. Both the analyses of aggregated data and analyses of data that are disaggregated by course suggest users typically are more likely to access lectures than assessments. Users also tend to attempt quizzes embedded in lectures more readily than other assessments. In short, an instructor's choices about the array of opportunities appear to influence user activity. These findings build on the conclusion by Guo, Kim, and Rubin (2014) that the length of videos in Edx MOOCs influences participation, with shorter videos being "much more engaging" (p. 2). The difference between access rates for embedded quizzes and stand-alone quizzes suggests that even minimal additional effort or time is a deterrent; stand-alone quizzes require more effort. This conclusion is consistent with Chi (2009), who notes that the demands on the user of activities defined as "constructive" and "interactive" are more taxing, require more effort and concentration, or simply require more time—all which reduce 'take up' of the learning opportunities. For course providers and platform managers, indicators like those developed in this study may be a useful first step in monitoring the extent to which different types and combinations of activities may be providing better opportunities for learning. Access indicators can also be used in marketing courses to potential users. Access rates can also show people who are interested in monetizing MOOCs or using them as advertising vehicles the actual reach of particular courses and segments of courses. And perhaps most importantly for faculty and instructional designers, access rates may inform instructional design choices.

Social media engagement rates are evolving as the industry matures and as technology develops. With this evolution new metrics for assessing the effectiveness of large-scale online courses may emerge. In the interim, the indicators described in this paper can be used as an empirical foundation for making instructional choices that may increase course completion, as well as other measures of user-benefits and effectiveness of MOOC offerings.

About the Authors

Alan Ruby is a senior fellow at the Alliance for Higher Education and Democracy, Graduate School of Education, University of Pennsylvania, 3700 Walnut Street, Philadelphia PA 19130; alanruby@ gse.upenn.edu. His research focuses on globalization and higher education and secondary school reform in newly independent nations.

Laura W. Perna, PhD, is James S. Riepe Professor and Executive Director, Alliance for Higher Education and Democracy (AHEAD), at the University of Pennsylvania, 3700 Walnut Street, Philadelphia, PA 19104; lperna@gse.upenn.edu. Her research interests focus on understanding how social structures, educational practices, and public policies promote and limit college access and success, particularly for individuals from lower-income families and racial/ethnic minority groups.

Robert F. Boruch, PhD, is University Trustee Chair Professor in the Graduate School of Education and the Statistics Department of the Wharton School at the University of Pennsylvania, 3700 Walnut Street, Philadelphia, PA 19104; robertb@gse.upenn.edu. His current research focuses on randomized controlled trials in different disciplines, big data, research ethics, and failure analysis.

Nicole Wang was a research fellow at the University of Pennsylvania, Graduate School of Education, she is now a PhD student in the Learning, Design, and Technology program at College of Education in Penn State University, 301 Keller Building, University Park, PA 16802. ; nwang@psu.edu.Her research focuses on MOOCs, quantitative analysis, evaluation, and big data.

References

Anand, S., & Hanson, K. (1997). Disability-adjusted life years: a critical review. *Journal of health economics*, *16*(6), 685-702.

Astin, A.W., (1984). Student involvement: a development theory for higher education. *Journal of College Student Personnel, 25*(4), 297-308.

Perna, L., Ruby, A., Boruch, R., Wang, N. Scull, J. Ahmad, S., & Evans C. (2014). Moving through MOOCs: understanding the progression of users in massive open online courses, *Educational Researcher, 43,* 421-432.

Azevedo, R. (2015). Defining and measuring engagement and learning in science: conceptual, theoretical, methodological and analytical issues. *Educational Psychologist. 50(1),* 84-94.

Beer, C. Clark, K., & Jones, D. (2010). Indicators of engagement. In C.H. Steel, M.J. Keppell, P. Gerbic & S. Housego (Eds.), *Curriculum, technology & transformation for an unknown future*. Proceedings ascilite Sydney 2010 (pp.75-86).

Bhupathiraju, S. N., Pan, A., Manson, J. E., Willett, W. C., van Dam, R. M., & Hu, F. B. (2014). Changes in coffee intake and subsequent risk of type 2 diabetes: three large cohorts of U.S. men and women. *Diabetologia*, *57*(7), 1346-1354.

Brinton, C.G., Lam, H., Chiang, M., Liu, Z., Jain, S., Wong, F. (2013, December). Learning about social learning in MOOCs: from statistical analysis to generative model. Unpublished paper.

Chen, P., Gonyea, R., & Kuh, G. (2008). Learning at a distance: engaged or not. *Innovate: Journal of Online Education*, *4*(3), 1-8.

Chi, M.T.H. (2009). Active-constructive-interactive: a conceptual framework for differentiating learning activities. *Topics in Cognitive Science. 1.* 73-105.

Coates, H. (2007). A model of online and general campus-based student engagement. *Assessment & Evaluation in Higher Education*, *32*(2), 121-141.

Coffrin, C., Corrin, L., de Barba, P., & Kennedy, G. (2014, March). Visualizing patterns of student engagement and performance in MOOCs. In *Proceedings of the Fourth International Conference on Learning Analytics and Knowledge* (pp. 83-92). ACM.

DMA (2012). Direct mail response rates beat digital. http://www.dmnews.com/dma-direct-mail-repsonse-rates-beat-digital/article/245780/

Dunham, K., (2014). The beginner's guide to social media metrics: engagement. http://blog.hootsuite.com/beginners-guide-engagement

Eyl, S., (2013, February 13). Study on Facebook engagement and interaction rates. fanpage karma. Retrieved from http://blog.fanpagekarma.com/2013/02/13/facebook-engagement-interaction-rates/

French, D., (2012). Reaching today's buyers through social media. *Furniture Today*, *36*(33).

Gee, J.P., (2013a). *The anti-education era: creating smarter students through digital learning*. New York: Palgrave MacMillan.

Gee, J.P., (2013b). Games for learning. *Educational Horizons 19(4),* 16-20.

Gee, J.P. & Hayes, E.R. (2011). *Language and learning in the digital age.* New York: Routledge.

Guo, P.J., Kim, J., & Rubin, R. (2014) How Video Production Affects Student Engagement: An Empirical study of MOOC Videos, L @ S 2014, March 4-5, Atlanta Georgia. http://dx.doi.org/10.1145/2556325.2566239.

Haggard, S., (2013). The maturing of the MOOC. Department of Business, Industry and Skills Research Paper No. 130.

Ho, A.D., Reich, J., Nesterko, S., Seaton, D.T., Mullaney, T., Waldo, J., & Chuang, I. (2014). Harvard X and MITx: the first year of open online courses. Harvard X & MITx Working Papers No.1.

Hoffman, D.L, & Fodor, M., (2010). Can you measure the ROI of your social media marketing? *MIT Sloan Management Review 52*(1), 41-49.

Hollebeek, L.D., Glynn, M.S., & Brodie, R.J., (2014). Consumer brand engagement in social media: conceptualization, development and validation. *Journal of Interactive Marketing 28*, 149-165.

Ken, D. (2014, March 15). Why engagement rate is more important than likes on your Facebook. Social media today. Retrieved from http://www.socialmediatoday.com/content/why-engagement-rate-more-important-likes-your-facebook

Kietzmann, J.H., Hermkens, K., McCarthy, I.P., & Silvestre, B.S., (2011). Social Media? Get serious! Understanding the functional building blocks of social media. *Business Horizons, 54,* 241-251.

King, M.A. (1972). Primary and secondary indicators of education. In A. Shonfield and S. Shaw (eds.), *Social indicators and social policy* (pp. 53-66). London: Heinemann Educational Books.

Koller, D., Ng, A., Chuong, D., & Chen, Z. (2013, May/June). Retention and intention in massive open online courses. *Educause Review*.

Kromann, N., & Green, A. (1980). Epidemiological studies in the Upernavik district, Greenland. *Acta Medica Scandinavica*, *208*(1-6), 401-406.

Kuh, G.D. (2009a). The national survey of student engagement: conceptual and empirical foundations. *New directions for Institutional Research*, *2009*(141), 5-20.

Kuh, G.D. (2009b). What student affairs professionals need to know about student engagement. *Journal of College Student Development. 50*(6), 683-706.

Kuh, G.D., Kinzie, I., Bridges, B.K., & Hayek, J.C., (2006). *What matters to student success: a review of the literature*. Washington D.C.: National Postsecondary Education Cooperative.

MOOCs @ Edinburgh Group (2013). *MOOCS @ Edinburgh 2013, Report #1*. University of Edinburgh. Retrieved from https://www.era.lib.ed.ac.uk/handle/1842/6683

OECD, (2014). *Education at a glance 2014: OECD indicators*. Paris: OECD Publishing.

Perna, L.W., Ruby, A., Boruch, R., Wang, N., Scull, J., Ahmad, S., & Evans, C. (2014). Moving through MOOCs: understanding the progression of users in MOOCs. *Educational Researcher, 43,* 421-432.

Price, D.V. & Tovar, E. (2014). Student engagement and institutional graduation rates: identifying high impact educational practices for community colleges. *Community College Journal of Research and Practice, 38*(9), 766-782.

PR Newswire (2013, July 24). Engagement rates for Stuart Weitzman's international Facebook campaigns exceed industry average by more than 5000%. Retrieved from http://www.prnewswire.com/news-releases/engagement-rates-for-stuart-weitzmans-international-facebook-campaigns-exceed-industry-average-by-more-than-5000-216736261.html

Robinson, C. C., & Hullinger, H. (2008). New benchmarks in higher education: student engagement in online learning. *Journal of Education for Business*, *84*(2), 101-109.

Sfard, A., (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher, 27(*2), 4-13.

Social Bakers, (2013, February 25). Engagement rate: a metric you can count on. Retrieved from http://www.socialbakers.com/blog/1427-engagement-rate-a-metric-you-can-count-on

Steffens, K. (2015). Competences, learning theories and MOOCs: recent developments in lifelong learning. *European Journal of Education 51*(1), 41-58.

Stone, R. (1970). *Mathematical models of the economy and other essays*. London: Chapman and Hall.

Thoms, B., & Eryilmaz, E. (2014). How media choice affects learner interactions in distance learning classes. *Computers & Education*, *75*, 112-126.

Tinto, V., (1975). Dropout from higher education: a theoretical synthesis of recent research. *Review of Educational Research 45*(1), 89-125.

Tinto,V., (1987). *Leaving college: rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.

White, D., & Le Cornu, A. (2011). Visitors and residents: a new typology for online engagement. *First Monday, 16*(9). doi:10.5210/fm.v16i9.3171

Wright, F., White, D., Hirst, T., & Cann, A. (2014). Visitors and residents: mapping student attitudes to academic use of social networks. *Learning, Media and Technology*, *39*(1), 126-141.

Yoon, E., & Eckels, J., (2013). Make these changes to help digital marketing fulfill its potential. *HBR Blog Network*, http://blogs.hbr.org/2013/05/mahe-these-chngaes-to-hekp-dig/