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Predicting Mathematics Teachers' Acceptance of Reflective Blogging to Improve Instruction

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COLLEGE OF EDUCATION

This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2016

Abstract

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Diana Sue Fesmire

MA, University of Texas, 1994

BAT, Sam Houston State University, 1987

Doctoral Study Submitted in Partial Fulfillment

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Abstract

An internal district audit identified that a rural, socioeconomically disadvantaged Southwestern school district has a lack of congruent and consistent implementation of the Common Core State Standards in mathematics. Innovative and cost-saving avenues for professional development (PD), such as reflective blogging, foster teacher learning to reconcile the enacted curriculum with the intended curriculum. This correlational study investigated the predictive power of technology acceptance and motivation constructs on reflective mathematics teachers' social media use intention and participation in informal, virtual Communities of Practice (vCoP). The framework that guided this study is the unified acceptance and use of technology and self-determination theory. English-speaking mathematics teachers who read, comment, and write reflective blogs within informal vCoP participated in the study (n = 104), with a response rate of 26.4%. The study employed 2 data collection methods: an automated tool that measured the intensity of participation in vCoP and an online survey measuring predictive constructs. Multiple linear regression analysis identified performance expectancy, effort expectancy, and intrinsic motivation as significant predictive constructs of social media use intention. The regression identified no significant predictor constructs of social media use behavior. Study results form the basis of a blended PD module created for rural mathematics teachers on the benefits of participation in informal vCoP. This study and resulting project contribute to positive social change for rural mathematics teachers by creating an environment to encourage personal reflection and collaboration with virtual colleagues and ultimately improve mathematical instructional practices.

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Dedication

This project study is dedicated to my family, especially my husband, Courtland who was patient and loving through the frustrations and celebrations. My mom, Helen Pratt, knew I could accomplish this and encouraged me all along the way. Finally, a special thank you to my sister, Barbara “Bobbie” Kellner, who patiently taught this mathematics educator to be a scholarly writer.

Acknowledgments

My successes are possible because of the help and support of others. I thank the Lord God for His many blessings throughout my doctoral journey. I can do all things through Christ who strengthens me.

Special thanks go to the members of my committee. Dr. Beate Baltes, you first invited me to explore virtual Communities of Practice and the research you were doing with Dr. Nistor. As your role at the university changed, you became a committee member, then my URR, but always, you stuck with me. It is absolute truth that my teaching and my scholarly life have been greatly shaped by you. Dr. Nicolae Nistor, you have been a “rock star” committee chair. The consistent support you provided in both content and method guided me throughout the process. Your encouragement was exactly what I needed to get through the rough times. Dr. Ann Jablonski, your fresh perspective was a welcome addition to the conversation and helped me make my project study even more thoughtful.

Finally, I acknowledge the middle school math teachers of my own district and my virtual colleagues of the *Mathtwitterblogosphere* (MTBoS), without whom, this study would not have been possible. Throughout this doctoral journey I have grown as a scholar and I have matured as a scholarly writer. Simultaneously, my teaching practice has improved because of the influence of my local and virtual colleagues.

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Section 1: The Problem

Introduction

Standards-based mathematics education reform began over 30 years ago with *A Call to Action* by the National Council of Teachers of Mathematics (NCTM, 1980) and a report claiming the United States was *A Nation At Risk* (Denning, 1983). Throughout the 1990s, NCTM created and refined standards for K-12 mathematics. After the turn of the century, many states used the NCTM standards as a guide to develop their own state-specific standards, required by No Child Left Behind legislation (Zbiek, Martin, & Schielack, 2012). Forty-three states and the District of Columbia recently adopted the new, more rigorous Common Core State Standards for mathematics (CCSSM; Harris & Rodriguez, 2011; Liebtag, 2013).

Common standards create new opportunities for collaboration and equity among students and teachers by concentrating on content and social justice (Liebtag, 2013). Adoption of common standards also places responsibility on preservice and in-service teachers (Knight et al., 2013). Daro (2011) explained, “At the end of the last mile on the journey from noble intentions of common standards to the reality of students learning, our hopes are in the hands of teachers” (p. 2). The purpose of this study was to investigate the predictive power of technology acceptance and motivation constructs on reflective mathematics teachers’ social media use intention and participation in informal virtual Communities of Practice (vCoP).

Definition of the Problem

The teachers of a diverse, rural, Southwestern school district (SSD) are grappling with implementation of the Common Core. The SSD lacks congruent and consistent middle school implementation of the CCSSM in a standards-based learning environment (SBLE). Auditors observed a low level of SBLE leading to instruction in classrooms incongruent with the CCSSM (Smith, 2013). Teachers inconsistently used curriculum, instructional practices, and common assessments adopted by the district in the strategic plan (Smith, 2013). Smith (2013) noted that the resulting rigor of instruction did not meet CCSSM expectations.

At the local study site, the middle school population is 51% White, 37% Hispanic, 8% Black, 2% Asian, and 2% Native American (Smith, 2014). About 58% of SSD students qualify for the federal Free/Reduced Lunch program (NMPED Student Nutrition Bureau, 2012). The federal government designated most of the district's schools as Title 1 schools, which is an indicator of poverty. The only non-Title 1 schools, located on a military base, face the challenges of highly mobile students.

The district provides 2 days of professional development (PD) before the start of every school year. The school district's 20 middle school math teachers continue to meet bimonthly as a professional learning community throughout the school year. A few mathematics teachers also voluntarily participate in programs offered by the closest university, approximately 70 miles away. The school district annually faces increasingly severe budget cuts due to a steady drop in student enrollment and rising costs. The area's remote location and these continuing fiscal shortfalls limit opportunities despite the school district's best efforts to provide quality PD for mathematics teachers.

Rationale

Evidence of the Problem at the Local Level

At the SSD middle schools, mathematics teachers lack congruent and consistent implementation of the CCSSM in a standards-based learning environment (SBLE). Each year, the school district sets goals in an annual strategic plan and conducts an internal audit of instructional practices at all grades and schools based on the plan. The school district limits its strategic plan to three goals, each with two objectives.

The district collects data for the audit through classroom observations and teacher interviews in language arts and mathematics K-12 classrooms. The school district's Strategic Planning Team analyzes the data and creates a report for district staff. The audit ratings scale is 0-2. A rating of 0 indicates *the least corrective action is required* in an area. A rating of 2 indicates *the highest level of concern for items needing immediate attention* (Smith, 2013). The audit from Spring 2013 highlighted concerns in the district's middle school classrooms (Smith, 2013). The areas of highest concern in the middle schools both lie in the school district's first goal (Smith, 2013).

1. Goal #1: Improve student achievement and faculty instructional knowledge and skills by developing and implementing a comprehensive, relevant, coherent, and focused professional development for all instructional staff.

2. Objective #1: Implement a Standards-based Learning Environment in all Pre-K through 12th grade classrooms to enhance student achievement.
3. Objective #2**:** Promote an alignment of language arts & mathematics instructional best practices, implementing the CCSS to support and enrich student achievement. (SSD, 2013, p. 8-10)

The district rated both SBLE and CCSS implementation a 2, the highest level of concern. Auditors noted undefined SBLE criteria and expectations leading to incongruent instructional practices in the classrooms. Teachers engaged in inconsistent and varying use of the curriculum, instructional practices, and common assessments adopted by the district in the strategic plan. The inconsistent instructional practices lead to the rigor of instruction failing to meet CCSSM implementation expectations (Smith, 2013).

Evidence of the Problem from the Professional Literature

The CCSSM provides an opportunity for classrooms across the United States to pair rigorous content with student-centered instructional strategies and promote higher-order thinking skills (Conley, 2011; Porter, McMaken, Hwang, & Yang, 2011a; Schoenfeld, 2013; Zbiek et al., 2012). Equitable implementation of these common standards requires a national focus on PD (Liebtag, 2013; Marrongelle, Sztajn, & Smith, 2013). An SBLE requires collaboration among students as they productively struggle with rigorous problems (Boesen et al., 2014). This method contrasts with traditional methods of practicing procedures in isolation (Boesen et al., 2014; Zbiek et al., 2012). Inservice teachers will need to be trained in these new methods of teaching. Mathematics teachers absorb surface aspects of reform and interpret them in terms of their own teaching beliefs (Ball & Cohen, 1996; Porter, McMaken, Hwang, & Yang, 2011b). Extensive and ongoing PD provides teachers with the level of understanding and knowledge needed to implement the CSSS (Liebtag, 2013). Innovative avenues foster teacher learning to reconcile the enacted curriculum with the intended curriculum (Conley, 2011; Porter et al., 2011b).

Social media adds a welcome platform for informal learning that contributes to formal PD (Blitz, 2013; Deng & Yuen, 2011; Duncan-Howell, 2010). Teachers learn mathematics content and instructional practices through collaboration with virtual colleagues in informal vCoP (Schmidt, 2013). However, teacher use of reflective blogging is not yet widespread (Project Tomorrow, 2011). Yet, Yuen, Yaoyuneyong, and Yuen (2011) found that 70% of the teachers showed interest in learning about blogs. In order to facilitate teachers taking advantage of this opportunity to improve instruction, researchers need to explore math teachers' intention to use social media and their usage behavior of social media (Tsai & Bagozzi, 2014).

Definitions

Blog: A weblog (shortened to blog) is a Web 2.0 technology wherein an individual publishes articles called posts, has discussions, and collects and shares resources (Lai & Chen, 2011; Luehmann, 2008).

Effort expectancy: The degree of ease a teacher believes blogging will create for teaching in an SBLE (Venkatesh, Morris, Davis & Davis, 2003).

Enacted curriculum: Teaching and learning that actually takes place in individual classrooms; co-constructed by teachers and students using available instructional materials (Ball & Cohen, 1996; Remillard, 2005).

Experienced competence: A user's awareness that he or she can effectively use a certain technology (Sørebø, Gulli, & Kristiansen, 2009).

Facilitating conditions: The degree to which a teacher believes that environmental factors exist to counteract obstacles to blogging (Venkatesh et al., 2003).

Intended curriculum: Teaching and learning prescribed in adopted standards (Tarr, Chavez, Reys, & Reys, 2006). In my study, the framework of the intended curriculum is the CCSSM.

Intrinsic motivation: The most autonomous form of motivation; a person's innate desire for new and challenging experiences (Ryan & Deci, 2000).

Perceived autonomy: A user's desire to self-regulate his or her interaction with a particular technology (Sørebø et al., 2009).

Perceived relatedness: A user's belief he or she shares a connection to other users of a particular technology *(*Sørebø et al., 2009).

Performance expectancy: The degree to which a teacher believes blogging will help them make gains in improving mathematical practice (Venkatesh et al., 2003).

Social influence: The degree to which a teacher believes that people whom the teacher considers important support his or her acceptance and use of blogging (Venkatesh et al., 2003).

Technology acceptance: The degree to which a teacher is disposed to use technology for a specific task as well as the person's behavior of actual use of the technology (Davis, 1989; Venkatesh et al., 2003).

Technology anxiety: The degree to which blogging evokes anxious or emotional reactions in a teacher (Venkatesh et al., 2003).

Virtual communities of practice: Informal learning environments on the Internet comprised of groups of people who share goals, activities, and experiences in the frame of a given practice (Johnson, 2001; Rheingold, 2000).

Significance

Improving instruction is a complex process involving reflection and collaboration (Boesen et al., 2014). The long-standing culture of individual teacher autonomy in U.S. public education makes the process more complex (Coburn, Mata, & Choi, 2013). The potential benefits outweigh the difficulty of the task. The quality of instruction delivered by the classroom teacher impacts student achievement more than any other factor (Ball & Cohen, 1996; Blitz, 2013; Kane, Taylor, Tyler, & Wooten, 2011). The CCSSM adoption "represents an unprecedented opportunity to improve U.S. mathematics education and to strengthen the international competiveness of the American labor force" (Cogan, Schmidt, & Houang, 2012, p. 1). Professional learning for mathematics teachers must meet the needs of teachers in large urban districts as well as small rural districts across the United States.

Many researchers have studied the characteristics of professional learning for mathematics teachers (Fishman et al., 2013; Garet et al., 2011; Harris & Sass, 2011;

Marrongelle et al., 2013). Collaboration improves instructional practices (Boesen et al., 2014; Byington, 2011; Hall, 2010; Hill, Beisiegel, & Jacob, 2013; Le Fevre, 2014). Collegiality helps teachers reflect together about instructional practice and co-construct improvements (Males, Otten, & Herbel-Eisenmann, 2010).

Social media offer mathematics teachers spaces for collaborative planning, enhancement of instructional strategies, and deepening understanding of mathematical content, thus providing opportunities to increase student achievement. The district introduced middle school mathematics teachers in SSD to social media opportunities both formal, such as Pearson-supported *Teachability*, and informal, such as the *Mathematics Twitter Blogosphere (*MTBoS) through PD. Some teachers participate in networks that support instructional improvement; others do not participate (Coburn et al., 2013). Teachers need peer collaboration for reflection in the informal vCoP to impact instructional practice in their own classrooms (Ching & Hursh, 2014).

Researchers have not sufficiently studied the model of combining acceptance and motivation factors to study reflective teacher bloggers' participation in vCoP. This quantitative correlation study investigated the predictive power of technology acceptance and motivation constructs on reflective mathematics teachers' social media use intention and participation in informal virtual Communities of Practice (vCoP) for its purpose.

Teachers in the United States participate in communities of practice significantly less than their international colleagues (Darling-Hammond, Wei, Andree, Rodriguez, & Orphanos, 2009). Locally, social media use remains limited, with most SSD teachers failing to participate in vCoP. Researchers do not know the predictive factors that influence mathematics teachers to use reflective blogging to improve their instructional practice through collaboration in vCoP.

Review of the Literature

Literature concerning implementation of the CCSSM, vCoP, social media as PD, educational technology acceptance, and motivation factors influencing participation in vCoP was obtained from recent, peer-reviewed, academic journals available from the Walden University Library, Google Scholar, the National Council of Teachers of Mathematics database, and the American Educational Research Association database. Additional research and information were collected from books and websites. Databases searched in the Walden University Library were Academic Search Premier, Education Research Complete, Sage Premier, Science Direct, Thoreau Multiple Database Search, and Web of Science. Specific search terms used were *Common Core State Standards, Common Core, middle school, math*, blog*, technology acceptance model, communities of practice, social networking, self-determination theory,* and *standards-based learning environment.* Additional resources were identified through table of contents searches in journals with high Impact Factor in Education & Education Research as determined by *Journal Citation Reports® Social Sciences Edition 2012*. Saturation was reached when the database searches and the references listed in recent peer-reviewed journal articles yielded no additional relevant sources and the conceptual framework of virtual communities of practice and the theoretical frameworks of technology acceptance and motivation were thoroughly described.

Introduction

Effective implementation of the CCSSM transforms mathematics classroom practices. Properly enacted curriculum supporting CCSSM engages middle school mathematicians in rigorous worthwhile problems (Conley, 2011). In contrast, a teacher can use instructional strategies that routinely lower the cognitive demand of challenging mathematical tasks (Jackson, Garrison, Wilson, Gibbons, & Shahan, 2013). Each teacher impacts student achievement directly through how the teacher teaches in the classroom (Fishman et al., 2013; Gorozidis & Papaioannou, 2014). Student engagement and achievement correlate highly to perceived teacher expectations and teacher self-efficacy (Sakiz, Pape, & Hoy, 2010).

Many reform initiatives fail to achieve intended change because teachers do not actually enact these changes, although they espouse a desire to change their practices (Boesen et al., 2014; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012; Le Fevre, 2014). Consequently, instruction aligns only weakly with standards, and the enacted curriculum is far from the intended curriculum (Polikoff, 2013; Porter et al., 2011b; Schmidt & Houang, 2012). Reform needs to be viewed in terms of a continuum of change rather than something that happens immediately when ideas are introduced (Boesen et al., 2014). Teachers need collaboration and reflection, creating cultures of productive, fair mathematical discourse to counteract the legacy of inequitable math instruction (Hall, 2010; Ritchie, 2012).

Access to and advances in technology continue to change the way teachers communicate. Almost all teachers have access to the Internet, both at school (99%) and at home (96%; Gray, Thomas, & Lewis, 2010). Ninety-six percent of teachers use Internet-based tools to communicate with colleagues and students' families (Project Tomorrow, 2011).

Virtual Communities of Practice

Groups of people who share goals, activities, and experiences in the frame of a given practice comprise informal learning environments called CoP (Wenger, 1999). The domain, the community, and the practice are three essential characteristics of CoP (Wenger, 2011). The shared area of interest or theme that brings the members together forms the domain of CoP. Members of the community form connections allowing collaboration and capacity building. Communities of Practice are more than groups of people with a common interest (Wenger, 2011). For instance, *Mathtwitterblogosphere* (MTBoS) is an informal global group of passionate mathematics educators who desire to improve instruction over time through the use of Web 2.0 technologies (Shah, 2013).

Teachers encounter CoP in a multitude of settings, both offline and online. Participation in vCoP enhances individual knowledge, strengthens rapport among people, and deepens group understanding in the platform of the Internet (Rheingold, 2000). Within a professional vCoP, participants develop proficiencies, gain diverse perspectives, and resolve workplace challenges (Lin, Hung, & Chen, 2009). Participation in a CoP leads to the accumulation of experience, stimulates the social construction of knowledge, and encourages the development of expertise (Darling-Hammond et al., 2009; Hall, 2010; Paavola, Lipponen, & Hakkarainen, 2004). Nistor, Baltes, and Schustek (2012) defined expertise as sophisticated understanding of domain-specific content.

Nistor and Fischer (2012) demonstrated that expert status in vCoP is influenced by participation in the community; participation significantly mediates the influence of expertise on expert status (Nistor et al., 2012; Nistor et al., 2014a). The focus of the experts reaches beyond improving their own understanding to the creation and deepening of shared knowledge within the group (Bereiter, 2002). In addition, McMillan (2011) and Ching and Hursh (2014) suggested that community participation is also influenced by participants' sense of community.

Numerous communities are found in schools, universities, and among teachers and researchers (Coburn et al., 2013; Hall, 2010; Males et al., 2010; Nistor & Fischer, 2012; Nistor, Lerche, Weinberger, Ceobanu, & Heymann, 2014b; Prestridge, 2014). A significant, dedicated section of Web 2.0 technologies that include blogs or wikis specifically support practice in vCoP (O'Reilly, 2007). Recent studies provided evidence for the coconstruction and cocreation of knowledge in social media-based vCoPs (Baumer, Sueyoshi, & Tomlinson, 2011; Hanuscin, Cheng, Rebello, Sinha, & Muslu, 2014; Kerawalla, Minocha, Kirkup, & Conole, 2009; Wopereis, Sloep, & Poortman, 2010; Yang, 2009). Specifically, Ertmer et al. (2012) found that teacher participation in vCoP enabled the development of new instructional strategies to implement in the classroom and recommended the creation of PD opportunities to familiarize teachers with reflective teacher blogging.

Using social media as a research setting, Nistor et al. (2012, 2014a) reported a model for describing participation according to which social media use can be receptive (e.g., reading others' blogs) or generative (e.g., writing blog articles). Nistor et al. (2012)

and Deng and Yuen (2011) demonstrated that generative social media is a result of social roles in vCoP. Researchers need additional empirical evidence to confirm and generalize this finding.

Social Media as Professional Development

With the advent of the Web 2.0 technology in the past decade (O'Reilly, 2007), the use of social media increased and became current practice in formal and informal learning. The term Web 2.0, first used in 2004, describes a new type of Internet application (Murugesan, 2007). O'Reilly (2007) attempted to define Web 2.0 for the business community. The meaning remains somewhat elusive and commonly includes a list of characteristics, including: user-generated content, collaborative data sharing, social software, interactive web-based applications, and a web-based platform (Franklin & van Harmelen, 2007).

Web 2.0 applications allow participants to collaborate across the global Internet community in formal and informal ways (Huang, Hood, & Yoo, 2014). Popular Web 2.0 applications include podcasts, wikis, social networking sites, collaborative writing tools, video sharing tools, and blogs (Yuen et al., 2011).

Podcasts are a series of programs around a theme that can be downloaded from the Internet, like the *HowStuffWorks* podcast. Wikis are Web applications that allow crowd-sourced creation of content like *Wikipedia*. Social networking sites are Web platforms, such as *Facebook* and *Twitter,* where people share social information. Collaborative writing tools are web-based word-processing platforms like *Google Docs*. Video sharing tools are websites where users upload and view videos like *YouTube*.

Blogs, short for weblogs, are a series of posts presented in reverse chronological order focused on a theme (Luehmann & Borasi, 2011). As a Web 2.0 technology, the blog is one of the most popular online communication tools, employing text, graphics, audio, video, and hyperlinks (Chai, Das, & Rao, 2011).

The advent of Rich Site Summary (RSS) facilitated collaboration in blogs, sometimes referred to as digital diaries (O'Reilly, 2007). RSS allows a user to subscribe to a webpage, such as a blog, and get notifications when new content appears (O'Reilly, 2007). In this way, the process of writing and commenting on blogs became easier (Luehmann & Borasi, 2011). Potential for collaboration with colleagues beyond their own building and the voluntary nature of Web 2.0 tools attracted educators to participate in vCoP (Huang et al., 2014; Prestridge, 2014). Like many innovations in information and communication technology, Web 2.0 technology initially diffused through the Internet where informal learning environments such as vCoP increased its use (Rheingold, 2000; Wenger, 1999; Winston, Medlin, & Romaniello, 2012; Yang, 2009). Subsequently, schools and universities adopted Web 2.0 technology in instructional design to support formal learning environments. Reich, Murnane, and Willett (2012) examined the usage of social media in U.S. K-12 schools and identified several usage types, including teacher-initiated resource sharing. Participating in a vCoP through blogging gives teachers new and exciting opportunities for collaboration (Deng & Yuen, 2011).

Electronic platforms provide access to expertise and resources without the limitations inherent in face-to-face PD and are superior in promoting self-reflection of instructional practices (Blitz, 2013; Hur & Brush, 2009). Through reflective blogging, teachers assess their instruction, analyze challenges, plan adjustments, and change their instructional practice (Prestridge, 2014). In Beach's 2012 study, teachers identified flexibility as the greatest advantage of collaboration through social media. Educators can significantly vary their level of participation over periods of time in vCoP (Duncan-Howell, 2010). Teachers can read other teachers' blogs and improve their instruction in a safe, anonymous environment (Hur, Brush, & Bonk, 2012).

Karaman (2011) found that preservice middle school mathematics teachers benefited from the self-reflection and support of others through blogging. The math and science reflective teacher bloggers in Luehman and Borazi's (2011) study deepened pedagogical understanding and improved instructional practice through participation in vCoP. Among other researchers, Baumer et al. (2011), Kerawalla et al. (2009), Wopereis et al. (2010), and Yang (2009) provided empirical evidence of the advantages of social media in the special case of blogging. Yuen et al. (2011) found that 70% of the teachers in their study showed interest in learning about blogs.

Educators report value in using social networks to collaborate with colleagues and extend their professional learning (Drexler, Baralt, & Dawson, 2008; Duncan-Howell, 2010; Marrongelle et al., 2013; MMS Education, 2012; USDOE, 2013). Furthermore, the *National Education Technology Plan* supports participation in vCoPs (Atkins, 2010). The U.S. Department of Education (2013) recognizes participation in vCoP as an effective avenue of professional growth. However, a closer look at the statistical data from the cited studies revealed that social media are far from being as widespread as their promising effects may suggest. While 90% of teachers use the Internet for research, only one third use Web 2.0 tools, including blogs and wikis (Project Tomorrow, 2011). Consequently, it needs to be determined which factors predict social media intention and use for reflective teacher blogging to improve instructional practice.

Educational Technology Acceptance

Successful vCoP practice requires technology, specifically social media, acceptance and use because vCoP participants predominantly express use through social media. The concept of technology acceptance includes both a person's disposition to use technology for a specific task as well as the person's behavior of actual use of the technology (Davis, 1989). Researchers employed various theories and models, grounded in Davis's (1989) technology acceptance model (TAM) for more than 25 years to explore factors that predict a person's intention to use and usage of a specific technology. The theory of reasoned action (Fishbein & Ajzen, 1977), the diffusion of innovations theory (Rogers, 1962), and the social cognitive theory (Bandura, 1982) all influenced Davis (1989) in creating TAM. Subsequently, Goodhue and Thompson (1995) created the formative article that outlines the task-technology fit (TTF) model (Furneaux, 2012). Finally, Venkatesh et al. (2003) developed the unified theory of acceptance and use of technology model (UTAUT) by evaluating and integrating the constructs of the most common technology acceptance models (Pynoo & van Braak, 2014).

Theories of reasoned action and planned behavior. In the theory of reasoned action (TRA), Fishbein and Ajzen (1975) hypothesized that attitude and subjective norms could predict a person's behavior intention. Attitude is a measure of the sum of a person's beliefs about a behavior weighted by the person's assessment of those beliefs (Sheppard, Hartwick, & Warshaw, 1988). Subjective norm (SN) is the person's belief about what significant peers think of the behavior, also weighted by the personal importance of those peers' opinions (Hale, Householder, & Greene, 2002). Individual beliefs and peer beliefs act together and are weighted by the person's evaluation of importance to determine behavior intention (Fishbein & Ajzen, 1975). Hale et al. (2002) described this relationship using a mathematical equation where behavior intention is the sum of weighted attitude and SN. Behavior intention measures the strength of a person's intention to perform a voluntary act (Fishbein & Ajzen, 1975).

Ajzen (1991) modified TRA to include perceived behavioral control as an additional independent variable, creating the theory of planned behavior (TPB). Looking back over the 20 years since developing the TPB, Ajzen (2011) concluded it was still a widely used framework for predicting behavior. Although not incorporated in Davis's original TAM model, subsequent acceptance models assimilated constructs from TPB (Murillo Montes de Oca & Nistor, 2014). Pynoo et al. (2012) created and studied a combined TAM and TPB model (C-TAM-TPB). Tsai and Bagozzi (2014) applied the TPB framework to their study of 982 members of vCoP in Taiwan, concluding that culture played a significant role in social media use intention.

Technology acceptance model. According to Google Scholar, as of January 10, 2014, Davis's (1989) *MIS Quarterly* article "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology" has been cited 21,858 times in scholarly articles. Straub (2009) asserted TAM remains influential because it was the catalyst for research focused on how a person perceived a new technology. Focusing on a specific technology, TAM postulates predictor relationships between a user's perception of the usefulness and ease of use and the user's attitudes, intention, and actual adoption of that technology (Davis, Bagozzi, & Warshaw, 1989; Wong, Goh, & Rahmat, 2013).

The TAM framework can study a variety of technologies in diverse settings (Davis et al., 1989). The independent variables perceived usefulness (PU) and perceived ease of use (PEO) predict a person's attitude toward (A) and behavioral intention to use (BI) the studied technology, as shown in Figure 1 (Davis, 1989). Behavioral intention to use is defined both as a dependent variable to the independent variables of PU and PEO providing validity, and as a predictive, independent variable for actual use as both an independent and a dependent variable in the original TAM model (Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). Perceived usefulness signifies how strongly a person feels a technology will boost his or her productivity (Davis, 1989). Conversely, perceived ease of use (PEU) relates to how easy a person believes a technology will be to use (Davis, 1989). Educational researchers found that a teacher's adoption of a technology is related to his or her perception of its usefulness (Bourgonjon et al., 2013; Wong et al., 2013).

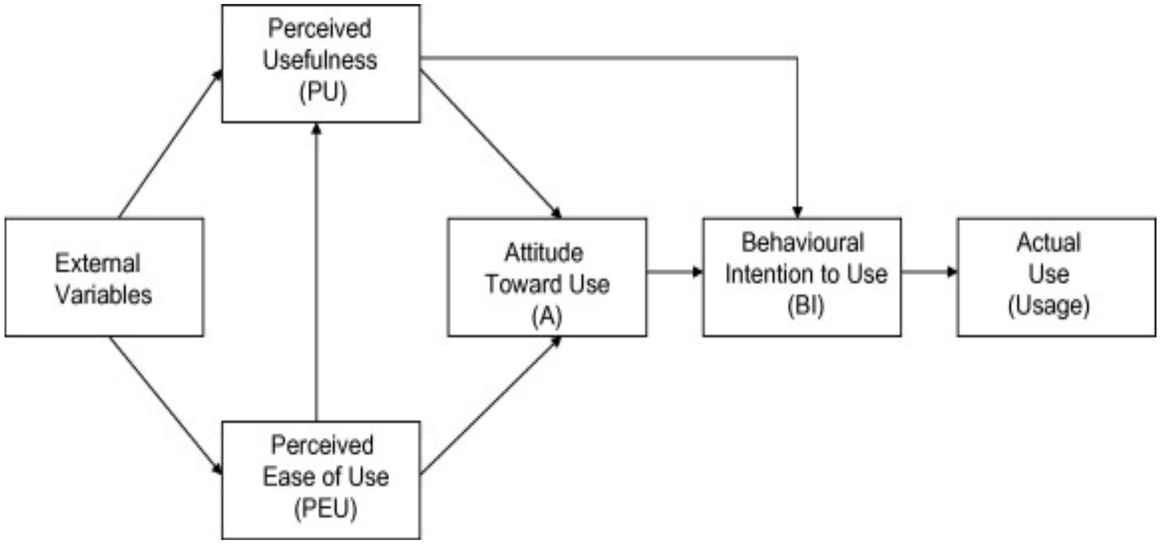


Figure 1. The original technology acceptance model (Turner et al., 2010).

Researchers generally employ a questionnaire using a multipoint Likert scale to indicate level of agreement to measure the TAM variables (Teo, 2011; Turner et al., 2010). Researchers used TAM and found PEU and PU are "statistically robust" (Harrison, Tomas, & Crook, 2014, p. 346). Perceived usefulness was a statistically significant predictor of technology use intention in most of Nair and Das's (2011) meta-analysis of sixty teacher-focused empirical studies.

The statistically parsimonious structure of TAM makes it particularly attractive to researchers (Davis et al., 1989; Nair & Das, 2011). Researchers often overlook the model's inherent limitations (Bagozzi, 2007). Users accept educational technologies through a very different process than office-oriented tools, according to Sumak, Hericko, and Pusnik's (2011) meta-analysis of 42 studies. Measures must be taken for teachers to feel confident in their ability to use a technology (self-efficacy) regardless of how easy and useful it might appear (Nair & Das 2011).

Venkatesh and Davis (2000) proposed a revision to the original TAM model, coined TAM2, which removed the variable of attitude and incorporated new variables, including subjective norm or social influence, as proposed in TRA and TPB (Turner et al., 2010). Venkatesh and Bala (2008) created another variation, TAM3, which delineated so many new constructs; the parsimonious nature of TAM was lost (see Figure 2).

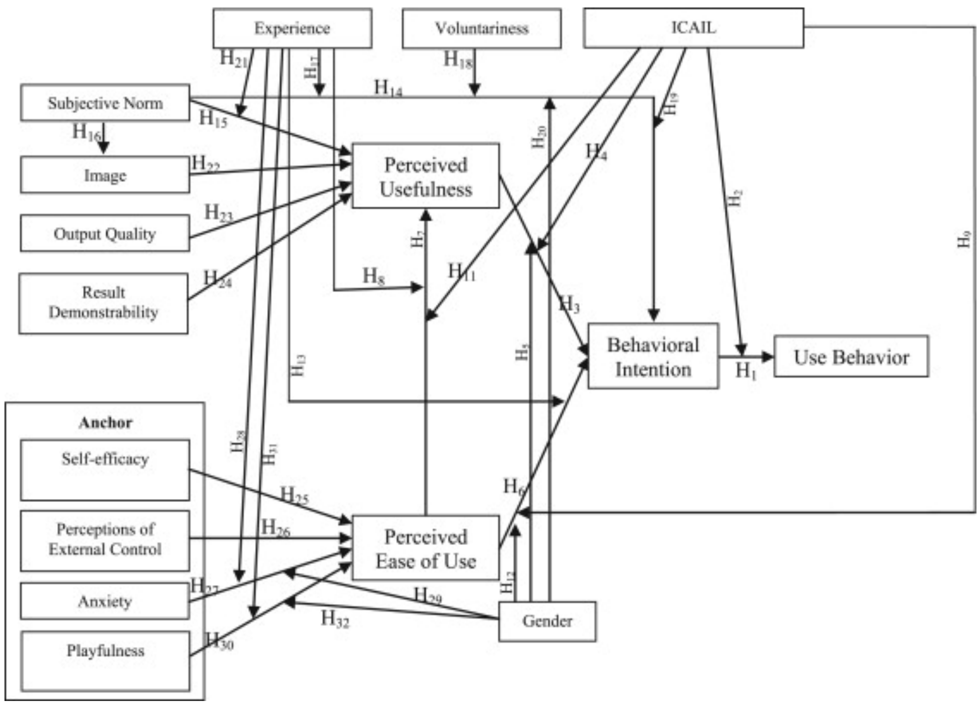


Figure 2. Technology acceptance model 3 (Faqih & Jaradat, 2015).

Furthermore, Agudo-Peregrina, Hernández-García, and Pascual-Miguel (2014) adopted TAM3 for their study, but did not find it to be better than TAM. Many researchers introduced additional external variables to TAM (Murillo Montes de Oca & Nistor, 2014). Meneses, Fàbregues, Rodríguez-Gómez, and Ion (2012) supplemented TAM's independent variables with sociodemographics and school-level info when studying 1,405 Spanish teachers. The researchers found the additional variables of sociodemographics and technology available within individual schools did not predict the variability of the teacher's technology acceptance (Meneses et al., 2012). Harrison et al. (2014) argued that models that augment TAM have not lead to a deepened understanding of the attitude-intention-behavior relationship.

Diffusion of innovations theory. Rogers published the first edition of *Diffusion of Innovations* in 1962 and the fifth and final edition in 2003. During Rogers' forty-year career, the nature of innovations, as well as the speed at which innovations develop, transformed. Diffusion of innovations theory (DOI), also known as innovation diffusion theory (IDT), is a research framework of change (Rogers, 2003). Diffusion is the spread of innovation over time and among people (Rogers, 2003).

The innovation decision process has five steps: knowing of the innovation, forming an attitude about the innovation, making a decision to adopt or reject the innovation, implementing the decision, and seeking confirmation of the decision to adopt (Rogers, 2003). Wu, Ye, and Looi (2015) applied the process to study teachers' adoption of a technological innovation in Singapore. Professional development informed the teachers of the innovation. The teachers formed attitudes. Each teacher chose to adopt or reject use. The adopters put the innovation into practice. Finally, all teachers looked to colleagues for support of their decision (Wu et al., 2015).

IDT model includes five characteristics that impact the adoption of the innovation: "relative advantage, compatibility, complexity, trialability, and observability" (Lai & Chen, 2011, p. 949). Relative advantage describes how the innovation is better than the original. Lee, Hsieh, and Hsu (2011) posit relative advantage is the most statistically significant predictive variable and compare it to PU in Davis's (1989) TAM. Compatibility measures how the innovation fits with the user's requirements for and beliefs about the usefulness of an innovation (Lee et al., 2011). Complexity is the user's perception of the difficulty of understanding the innovation similar to PEU in TAM. Trialability describes how convenient it is to try out the innovation, and observability is how visible the innovation will be to others (Lee et al., 2011). In a study of online students in Taiwan, Lee et al. (2011) validated the IDT and TAM integrated model.

Social cognitive theory. Social cognitive theory (SCT) combines behavioral theories and cognitive theories to describe learning within a social context (Bandura, 1986). Both outcome judgments and self-efficacy predict behavior (Bandura, 1982). Outcome judgments describe the perception of the results of successfully completing a behavior (Davis, 1989). Self-efficacy is a determination within a given situation of a person's own ability to perform a specific task (Huffman, Whetten, & Huffman, 2013). Self-efficacy is a predictor of adoption of innovation because people have to see themselves as capable of success before they are willing to try and continue when complications arise (Bandura, 2006). Straub (2009) concluded that SCT influences all adoption-diffusion theories "either explicitly or indirectly" (p. 628). Educational researchers, using a blended model of TAM with self-efficacy, found that self-efficacy was the most significant construct influencing BI (Holden & Rada, 2011; Park, Nam, & Cha, 2012). Linking to the TAM, Davis (1989) drew parallels between Bandura's self-efficacy variable to PEU and the outcome judgment variable to perceived usefulness. Straub (2009) cautions that self-efficacy and PEU are not collinear predictor variables.

Task-technology fit model. Goodhue and Thompson (1995) created and validated the task-technology fit model (TTF). Fit is defined as how well a certain technology works to accomplish a certain task (Mathieson & Keil, 1998). The dimensions of TTF are information quality, information availability, authorization to access data, data compatibility, ease of use, production timeliness, system reliability, and relationship with users (Goodhue & Thompson, 1995). Numerous researchers apply the TTF model to evaluate how the characteristics of a technology impact usage (Lu & Yang, 2014). Addressing TTF's longevity, Furneaux's (2012) meta-analysis found researchers are still adopting the model across the social sciences. Like TAM, TTF studies most often are quantitative, use a survey instrument, and collect self-reported data of intention and use (Aljukhadar, Senecal, & Nantel, 2014; Furneaux, 2012).

Educational research studies implementing a TTF model have been mixed results. In an uncommon qualitative study, Melchor-Ferrer and Buendía-Carrillo (2014) endorsed TTF as a viable technology acceptance model. Mathieson and Keil (1998) determined PEU, one of the key constructs of TAM and TTF, was a statistically significant factor predicting fit and fit predicted usage. Lin and Wang (2012) applied a blended model of TTF and SCT, finding significant impact of social technology fit on use behavior. Aljukhadar et al. (2014) found only two statistically significant variables, PEU and information quality, and concluded TTF was not an adequate framework.

Unified theory of acceptance and use of technology. Venkatesh et al. (2003) created the unified theory of acceptance and use of technology (UTAUT) by evaluating studies based on eight technology acceptance models and integrating constructs from each of them. The models were the motivational model (described in the next section), TAM, TRA, TPB, C-TAM-TPB, IDT, SCT, and the personal computer utilization model. Researchers use the UTAUT to explain the use of educational technology under the influence of use intention, which is further determined by performance expectancy (PE), effort expectancy (EE), and social influence (SI). Perceived facilitating conditions (FC) affect the use of educational technology (Venkatesh, Thong, & Xu, 2012). Venkatesh et al. (2003) theorized that gender, age, experience, and voluntariness of use moderate the impact of the variables (see Figure 3).

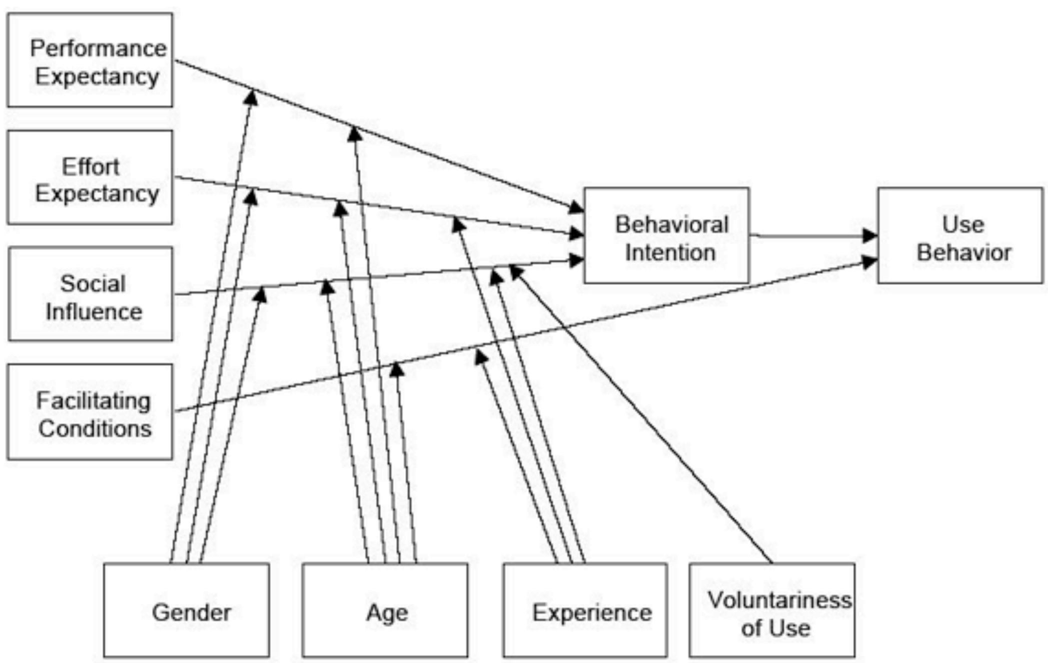


Figure 3. Unified theory of acceptance and use of technology model (Venkatesh et al., 2003).

Gruzd, Staves, and Wilk (2012) employed the UTAUT model to study postdoctoral scholars' use of blogs. Gruzd et al. (2012) explained that PE measures if the scholars find blogging to be useful in improving their research or instruction. EE describes how hard the blog is to use and captures the scholars' concerns about privacy. Social influence expanded for scholars whose physical and virtual colleagues recommended blogging. Facilitating conditions measured how helpful the scholars perceive blogging, including the time required to keep up with the vCoP. Lai and Chen (2011) tested for several negative effects; however, only the extra time required was a statistically significant predictor of adoption of a reflective blog. Straub (2009) observed that the predictive constructs of the UTAUT model show different levels of significance in different research settings.

Even though numerous scholars support the use of technology acceptance models to study acceptance of social media, some researchers have revealed shortcomings of previous acceptance research:

1. Current models are not appropriate for applications in complex learning environments because they are based on a one-dimensional concept of acceptance (Bourgonjon et al., 2013; Meneses et al., 2012; Murillo Montes de Oca & Nistor, 2014). In particular, acceptance models do not differentiate between the use of technology for the sake of technology (Wang, 2010) and the use of technology to perform certain learning activities. Current technology acceptance models are largely individual; however, decisions regarding usage are often made collaboratively (Bagozzi, 2007).

2. The assumed effect of behavioral intention on actual technology use is conceptually, methodologically, and empirically questionable (Bagozzi, 2007). Several researchers found only weak or nonsignificant effects (Agudo-Peregrina et al., 2014; Nistor, Göğüş, & Lerche, 2013). Most TAM studies do not measure actual usage. Furthermore, researchers who do measure actual use commonly rely on self-reporting of use; therefore, exaggeration of the intention-actual use correlation may exist (Podsakoff, MacKenzie, & Podsakoff, 2012). Murillo Montes de Oca and Nistor (2014) found use intention was not a statistically significant predictor of use behavior. In a meta-analysis of TAM studies, Turner et al. (2010) found self-reported technology use was often flawed and recommended future researchers employ objective data collection methods. Pynoo and van Braak's (2014) study of an education portal by 864 teachers found that although actual receptive use was correlated to self-reported use, generative use was not accurately self-reported.
3. Acceptance models are validated mostly for receptive use (i.e., retrieving information; Venkatesh et al., 2012). The generative use, a typical feature of Web 2.0 and social media, has not been sufficiently considered (Pynoo & van Braak, 2014). Lai and Chen (2011) claimed that there is a "lack of attention to factors that support or hinder teachers' adoption of reflective blogs" (p. 949).

4. As a consequence for educational practice, management, and policy, acceptance theorists suggest that better technology produces more intensive use, which implies that resources should be invested in more up-to-date, more "fashionable" technology (Wang, 2010). These investments may increase learners' intentions to use the technology, as predicted by UTAUT. However, if behavioral intentions do not have significant effects on the actual use behavior (Agudo-Peregrina et al., 2014; Bagozzi, 2007; Nistor et al., 2013; 2014a), the targeted educational use of technology may not be reached, and the resources may be wasted. "Teachers need to believe not only that the innovation is important and useful, but that the school district is flexible with support of that change" (Straub, 2009, p. 645).

The UTAUT can describe social media acceptance and predict social media use. Nevertheless, the UTAUT model should be validated for the case of generative technology use, while taking its shortcomings into account and exploring alternative explanations (Nistor, 2014a).

Motivational Aspects

Researchers need to explore motivational aspects while attempting to find alternative explanations for social media intention and use. Motivation is the intensity and type of desire to perform a task (Mitchell, 1982). Motivation drives human behavior, and especially learning; however, motivation is not a behavior or act itself (Mitchell, 1982). Motivation is complex and cannot be described by a single construct (Ryan &

Deci, 2000). The study of motivation centers on the factors that foster and undermine humans' natural positive potential (Ryan & Deci, 2000).

Self-determination theory. Ryan and Deci (2000) developed self-determination theory (SDT) as a differentiated approach to motivation research, examining the type and level of motivation being demonstrated. Moreover, Deci and Ryan (2012) conjecture that understanding the type of motivation and level of self-regulation is more critical than calculating the intensity of motivation when predicting behavior. Researchers developed SDT using traditional empirical methods with applications to varied research settings including education (Ryan & Deci, 2000). Although researchers developed SDT in the 1970s, it continues to influence motivation research, and studies employing SDT have flourished (Deci & Ryan, 2008). Over time, the focus of SDT shifted from intrinsic versus extrinsic to autonomous versus controlled motivation (Deci & Ryan, 2008).

Through SDT, Ryan and Deci (2000) identified three innate psychological needs: experienced competence, perceived relatedness, and perceived autonomy. Experienced competence describes the need to see one's self as capable, similar to Bandura's construct of self-efficacy (Kreijns, Vermeulen, Van Acker, & van Buuren, 2014). Perceived relatedness depicts the need to be connected to others, which can be nurtured within successful professional learning communities such as vCoP (Sørebø et al., 2009). Autonomy refers to the perception to which a person is able to make decisions and self-regulate personal behavior (Sørebø et al., 2009). If these innate needs are fulfilled, an individual will optimize motivation; however, if the needs are thwarted, motivation will be minimized (Aharony, 2014).

Intrinsic motivation, the most autonomous form of motivation, is a person's innate desire for new and challenging experiences (Ryan & Deci, 2000). Researchers use SDT to examine the conditions that support or inhibit intrinsic motivation and self-regulation (Ryan & Deci, 2000). Intrinsic motivation, vital to learning, is supported by experiences that promote competence and are perceived as autonomous (Deci & Ryan, 2012). The classification of motivation and regulation along a continuum form the basis of SDT (see Table 1).

Table 1

Self-Determination Theory (Kreijns et al., 2014)

Behavior	*Nonself-Determined*			*Self-Determined*		
Type of Motivation	*amotivation*	*controlled*				*autonomous*
Type of Regulation	*non-regulation*	*external*	*introjected*	*identified*	*integrated*	*intrinsic*
Locus of Causality	*impersonal*	*external*	*somewhat external*	*somewhat internal*	*internal*	*internal*

Teacher motivation. Effective implementation of the CCSSM will require in-service teachers to change their instructional practices (Marrongelle et al., 2013; Rothman, 2012; Schmidt & Houang, 2012; Zbiek et al., 2012). Many researchers studied how and why teachers engage in innovation (Gorozidis & Papaioannou, 2014). Chen and Jang (2010) further defined each of the innate needs of SDT in terms of teachers' motivations to use technology. Competency was measured as the teachers' experience with technology and comfort navigating the Web 2.0 tools. Neves de Jesus and Lens (2005) found that self-efficacy was the basis for teachers' intrinsic motivation because perception of competence was directly linked to their instinctive motives. Relatedness was measured as the teachers' perceived social interaction and communication within the vCoP. Finally, autonomy was measured by teachers' perception of the voluntariness and flexibility of timing in the asynchronous learning community (Chen & Jang, 2010).

Teacher motivation is an essential shaping construct in predicting the adaptation of innovation in education (Schellenbach-Zell & Gräsel, 2010). Lin and Lu (2011) found that both extrinsic and intrinsic motivation influenced teachers' behavior intention; however, only intrinsic motivation influenced actual and continuing use. Gorozidis and Papaioannou (2014) found a strong, positive correlation between teachers' intrinsic motivation and perseverance when implementing innovative curriculum. An intrinsically motivated teacher begins and continues innovation for the inherent value and enjoyment (Neves de Jesus & Lens, 2005). Chen, Lai, and Ho (2015) hypothesized, "When teachers' use of teaching blogs remains voluntary over time, the intention-usage link becomes stronger" (p. 246). People who use technology in their spare time, such as teachers who blog, simply display more intrinsic motivation (Agudo-Peregrina et al., 2014).

Motivation and technology acceptance. Researchers must distinguish between intrinsic motivation and extrinsic motivation (Schellenbach-Zell & Gräsel, 2010). Performance and effort expectations in the context of technology use cause individuals to expect the technology to be rewarding (Venkatesh et al., 2012). Researchers draw parallels between technology acceptance and extrinsic motivation (Venkatesh et al., 2012).

Acceptance theories do not specifically address intrinsic motivation, and generic evidence of the influence of intrinsic motivation on technology use is scarce (Nistor, 2014a). Beaudry and Pinsonneault (2010) observed that emotions are not generally considered in technology acceptance research. In the field of health sciences, scholars successfully integrated a framework of acceptance with a model of SDT (Hagger & Chatzisarantis, 2009). Available studies integrating technology acceptance and self-determination theory present promising positive results. For example, Aharony (2014) found a statistically significant positive correlation between teachers' motivation and behavioral intention to use technology.

Implications

My correlation study investigated the predictive power of technology acceptance and motivation constructs on reflective mathematics teachers' social media use intention and participation in informal virtual Communities of Practice (vCoP) for its purpose. Luehmann and Tinelli (2008) found that practicing teachers effectively used blogging to reflect on and improve instruction. Blogging offers support for teachers enhancing reflection and creating instructional change (Byington, 2011; Ertmer et al., 2012; Luehmann, 2008). However, "teachers' level of investment in blogging can influence the degree to which they realize its benefits" (Hanuscin et al., 2014, p. 14). Educational researchers need to study factors that cause teachers to participate and continue participation in blogs (Chen, Lai, & Ho, 2015; Huang et al., 2014; Luehmann, 2008). The results of these studies illuminate the predictive factors for mathematics teachers' participation in reflective blogging. A professional development plan to support math teachers' participation in vCoP, in particular blogging, to improve instruction could be created based on these findings. Reflective mathematics teacher bloggers create positive social change through their collaboration with virtual colleagues and within their own classrooms.

Research Questions and Hypotheses

The quantitative correlation study was guided by the following research questions:

Main Research Questions

1. To what extent does social media acceptance predict reflective mathematics teacher bloggers' social media use intention and participation in vCoP?
2. To what extent does intrinsic motivation predict reflective mathematics teacher bloggers' social media use intention and participation in vCoP?

Subresearch Questions and Hypotheses

1. To what extent do performance expectancy, effort expectancy, and social influence predict reflective mathematics teacher bloggers' social media use intention?

$H_0$1a: Performance expectancy does not predict reflective mathematics teacher bloggers' social media use intention.

H_A1a: Performance expectancy does predict reflective mathematics teacher bloggers' social media use intention.

$H_0$1b: Effort expectancy does not predict reflective mathematics teacher bloggers' social media use intention.

H_A1b: Effort expectancy does predict reflective mathematics teacher bloggers' social media use intention.

$H_0$1c: Social influence does not predict reflective mathematics teacher bloggers' social media use intention.

H_A1c: Social influence does predict reflective mathematics teacher bloggers' social media use intention.

2. To what extent do social media use intention, facilitating conditions, and technology anxiety predict reflective mathematics teacher bloggers' participation in vCoP?

$H_0$2a: Social media use intention does not predict reflective mathematics teacher bloggers' participation in vCoP.

H_A2a: Social media use intention does predict reflective mathematics teacher bloggers' participation in vCoP.

$H_0$2b: Facilitating conditions do not predict reflective mathematics teacher bloggers' participation in vCoP.

H_A2b: Facilitating conditions do predict reflective mathematics teacher bloggers' participation in vCoP.

$H_0$2c: Technology anxiety does not predict reflective mathematics teacher bloggers' participation in vCoP.

H_A2c: Technology anxiety does predict reflective mathematics teacher bloggers' participation in vCoP.

3. To what extent does intrinsic motivation predict reflective mathematics teacher bloggers' social media use intention?

$H_0$3: Intrinsic motivation does not predict reflective mathematics teacher bloggers' social media use intention.

H_A3: Intrinsic motivation does predict reflective mathematics teacher bloggers' social media use intention.

4. To what extent does intrinsic motivation predict reflective mathematics teacher bloggers' participation in vCoP?

$H_0$4: Intrinsic motivation does not predict reflective mathematics teacher bloggers' social participation in vCoP.

H_A4: Intrinsic motivation does predict reflective mathematics teacher bloggers' social participation in vCoP.

5. To what extent do perceived autonomy, experienced competence and perceived relatedness predict reflective mathematics teacher bloggers' intrinsic motivation?

$H_0$5a: Perceived autonomy does not predict reflective mathematics teacher bloggers' intrinsic motivation.

H_A5a: Perceived autonomy does predict reflective mathematics teacher bloggers' intrinsic motivation.

$H_0$5b: Experienced competence does not predict reflective mathematics teacher bloggers' intrinsic motivation.

H_A5b: Experienced competence does predict reflective mathematics teacher bloggers' intrinsic motivation.

$H_0$5c: Perceived relatedness does not predict reflective mathematics teacher bloggers' intrinsic motivation.

H_A5c: Perceived relatedness does predict reflective mathematics teacher bloggers' intrinsic motivation.

Summary

Reflective mathematics teacher bloggers' participation in vCoP might be related to two categories of processes. First, according to UTAUT (Nistor et al., 2014a), the use of social media and participation in vCoP might be influenced by participants' intention to use social media, facilitating conditions, and technology anxiety. The intention to use social media is further impacted by performance expectancy, effort expectancy, and social influence. Although there has been extensive research of technology acceptance factors, there are insufficient studies set in social media settings, particularly informal vCoP.

Secondly, participation in vCoP might also be influenced by intrinsic motivation, whereas intrinsic motivation might be a result of perceived autonomy, experienced competence, and perceived relatedness (Ryan & Deci, 2000). Although Venkatesh et al. (2003) claimed that motivation is incorporated into UTAUT, the relationship between acceptance and motivation is unclear.

This section included a discussion of the study's (a) definition of the problem, (b) evidence of the problem at the local and professional level, (c) operational definitions; (d) significance, (e) research questions and hypotheses, (f) review of the literature, and (g) implications. In the Section 2, I will describe (a) quantitative research design and approach; (b) setting and sample; (c) measures; (d) instrumentation and materials; (e) data collection and analysis; (f) results; (g) discussion; (h) assumptions, limitations, scope, and delimitations; and (g) ethical considerations. In Section 3, I will use the findings of my study to describe (a) description of the blended PD module; (b) rationale; (c) project goals and target audience; (d) components, timelines, and activities. In Section 4, I will reflect on the strengths and limitations of my study and project and on my growth as a scholar-practitioner.

Section 2: The Methodology

Introduction

The purpose of my correlation study was to investigate the predictive power of technology acceptance and motivation constructs on reflective mathematics teachers' social media use intention and participation in informal virtual Communities of Practice (vCoP). I grounded my study in the technology acceptance model and the self-determination theory. Acceptance theories and models, like UTAUT, predict the use of educational technologies (Venkatesh et al., 2012). Gruzd et al. (2012) used a qualitative approach to explore the application of the UTAUT model in the specific setting of social media in informal vCoP. Several shortcomings of UTAUT require a deeper insight and additional empirical research on the influence of technology acceptance in social media-based settings (Bagozzi, 2007). Educational research should provide and validate technology acceptance models that are appropriate not only for generic information systems, but also for educational applications (Sumak et al., 2011). Such models may ground more effective instructional design and management, increasing and improving the educational technology use in general, and the use of social media in particular.

In this study, I examined reflective mathematics teacher practices involving blogs to identify predictors of teachers' social media usage. The study: (a) was positioned in informal educational settings (i.e., vCoP) and some online learning environments; (b) aimed to validate UTAUT for generative use of social media; and (c) took into consideration the effects of additional educational aspects, such as motivation, which may influence technology acceptance. U.S. public school stakeholders may have an impact on the factors found to have a positive and significant relationship to social media intentions and use this knowledge to enhance teacher participation, impact instruction, and increase student achievement in mathematics. This section includes a discussion of the study's (a) research and design approach; (b) research questions and hypotheses (c) setting and sample; (d) measures; (e) instrumentation and materials; (f) data collection and analysis; (g) results; (h) discussion; (i) assumptions, limitations, scope and delimitations; (j) ethical considerations for the protection of participants' rights; and (k) conclusions.

Research Design and Approach

A quantitative method fit my project study best because quantitative researchers test theories by exploring the relationships among variables (Creswell, 2009). In order for a research study to produce meaningful results, the researcher chooses an appropriate methodology matched to the research questions (Vogt, 2007). Quantitative research stems from the philosophical theory of post-positivism (Creswell, 2009). Post-positivists believe that objectivity and generalizability are critical characteristics of research; however, unlike their positivist predecessors, they examine phenomena in terms of probabilities, not certainties (Mertens, 2010).

Post-positivists advise that investigating relationships among variables is fundamental to answering questions and hypotheses through surveys (Creswell, 2009). Relationship studies include the following characteristics: (a) at least two potentially related variables; (b) one group of participants, no control group; (c) one-time data collection; (d) individual scores for each variable; and (e) pair-wise statistical tests to calculate correlations between variables (Lodico, Spaulding, & Voegtle, 2010). To examine the research questions of my study, I used a correlation study with cross-sectional data. In correlation studies, researchers focus on the magnitude and direction of relationships between variables (Lodico et al., 2010). A correlation design fit this study, as variables were not controlled and the purpose of the study was to identify and describe predictive factors of teachers' participation in blogging to improve instruction.

A gap in the literature exists concerning predictive acceptance and motivational factors of English-speaking mathematics teacher bloggers' participation in vCoP; however, researchers have used Venkatesh et al.'s (2003) UTAUT model and questionnaire to teachers' acceptance of study technology. Pynoo et al. (2012), Teo (2011), and Pynoo and van Braak (2014) used the UTAUT framework in correlation studies of teachers' technology acceptance of an educational portal to examine predictive factors of secondary teachers' acceptance of a digital learning environment. Nistor et al. (2014b) combined the UTAUT model with a model of culture in a correlation study of 3000 university students and faculty. The UTAUT questionnaire has also successfully been paired with the automated social network analysis tool to gather objective data of actual use (Nistor et al., 2014a).

Additionally, researchers have used the SDT framework to study teachers' technology acceptance in correlation designs. Sørebø et al. (2009) used the SDT framework to study Norwegian teachers' intention to continue use of e-learning technology. Researchers adapted SDT to study teachers' adoption of innovation and technology acceptance using a survey design and correlation study with multiple regression analysis in Greece, the Netherlands, and Germany (Gorozidis & Papaioannou, 2014; Kreijns et al., 2014; Schellenbach-Zell & Gräsel, 2010). Combining SDT and TAM, Aharony (2014) studied the use of e-books by 300 school librarians and university library science students in the United States. In a longitudinal study of predictive factors of continued use of reflective blogs, Chen et al. (2015) combined the UTAUT and SDT framework.

Most researchers choose a correlation design to study technology acceptance. However, Gruzd et al. (2012) employed a qualitative method using interviews of about 51 university faculty members to gather data using the UTAUT model. I rejected a qualitative design for my study because I needed to generalize the findings to apply my results to the creation of PD for the mathematics teachers in SSD.

I used an online survey to measure all variables except use behavior. Surveys are the most commonly used design in education research (Fink, 2012). I chose a survey design because, according to Muijs (2011), survey research is well suited to analyzing the relationships between quantitative variables and because my research questions were answered by asking structured questions from a varied group of participants and analyzing their responses (Vogt, Gardner, & Haeffele, 2012). In this study, I explored the relationships among the independent variables of performance expectancy, effort expectancy, social influence, facilitating conditions, technology anxiety, perceived autonomy, experienced competence, perceived relatedness, intrinsic motivation, and the dependent variables of reflective teacher bloggers' participation in vCoP, social media use intention, and intrinsic motivation (see Figure 4). Inferential statistics, including multiple linear regressions, were used to analyze quantitative data and explore the relationships among the variables. Furthermore, I collected and analyzed descriptive statistics to create a picture of the reflective mathematics teacher bloggers who form my sample.

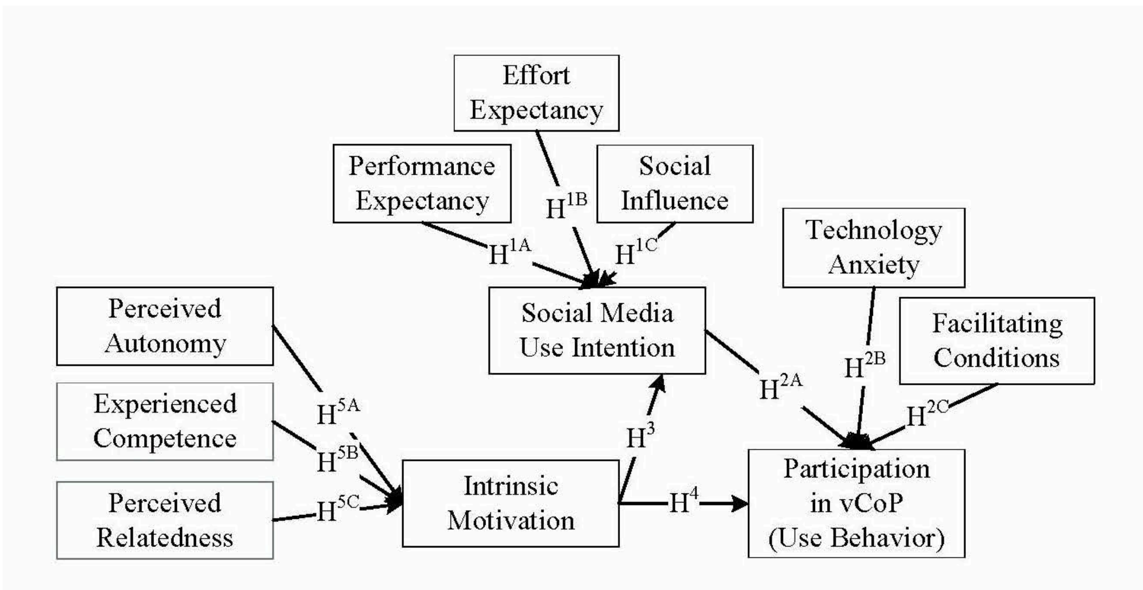


Figure 4. Purposed research model.

Setting and Sample

The research setting for the study was informal virtual communities of practice on the Internet. English-speaking mathematics teachers voluntarily collaborate with virtual colleagues through self-created blogs and informal blogging communities. Within vCoP, math teachers pursue, gather, and contribute knowledge to develop their pedagogical competencies; incorporate appropriate technology in their classrooms; and work through instructional difficulties with virtual colleagues (Byington, 2011; Lin et al., 2009; Prestridge, 2014). Participation in a vCoP leads to the accumulation of experience, stimulates the social construction of knowledge, and encourages the development of expertise (Lai & Chen, 2011). The population consists of English-speaking mathematics teachers who read, comment, and/or write reflective blogs within informal vCoP on the Internet.

Sampling Strategy and Sample Size

Potential participants' blogs were identified through Internet searches, MTBoS, hyperlinks on math teachers' blogs, the #msmathchat Twitter feed, and Math Twitter Camp 2015. Internet searches included the parameters of *mathematics, math teacher, Word Press, BlogSpot,* and *blog*. MTBoS is an informal global group of secondary school math teachers who blog, read, and comment on each other's blogs. I joined MTBoS in March 2014 and regularly read and comment on community members' blogs. The MTBoS webpage contains a list of active math teacher bloggers sorted by grade band and area of interest as well as a hyperlink to a Google spreadsheet listing over 100 math teacher bloggers. Reflective math teacher blogs often include hyperlinks to the blogs of others. The Twitter feed *#msmathchat* is a weekly chat of a middle school math teacher vCoP where tweets often include links to math teacher blogs. Math Twitter Camp is an annual conference of math teachers who use social media to collaborate to improve instructional practices. I attended Math Camp July 23 – 26, 2015 at Harvey Mudd College in Riverside, California.

The sampling of math teacher bloggers for my study was a nonprobability purposeful sample (Lodico et al., 2010). A snowball technique was used to build the sample to approximately 100 participants. This sampling strategy allowed me to invite participants from various informal reflective mathematics teaching vCoP across the Internet. The reflective mathematics teacher bloggers were invited by email, Twitter, and in person to learn about the study and navigate to the URL to complete the informed consent and the online survey. Additionally, a few blog authors posted an invitation to other members of the informal vCoP to participate in the study, including a hyperlink to my blog where an explanation of the study, an invitation to participate, and a URL to the actual survey was posted. Demographic information was collected, allowing me to generalize the results with a clear understanding of how my sample is representative of the population. A power analysis was used to determine sample size using typical level of significance ($p = 0.05$), typical power ($1–\beta = 0.8$), and previously reported SDT & UTAUT effect size ≈0.4 (Creswell, 2012; Sørebø et al., 2009; Venkatesh et al., 2003).

Initially, I predicted a personalized invitation to participate in the study would be sent to at least 200 reflective mathematics reflective blog users, expecting a response rate for the questionnaire survey of approximately 50%. Personalizing the email invitations positively affects motivation to participate in the survey and increases participants' interest in finishing the task (Sánchez-Fernández, Muñoz-Leiva, & Montoro-Ríos, 2012). Additionally, reflective mathematics teacher bloggers who participated in the survey were invited to post a link to my blog, allowing the receptive members of the informal vCoP to participate in the study. Research has shown that online survey response rates increase when participants know the sponsor, are interested in the topic, and find the completion time acceptable (Fan & Yan, 2010). The length of the survey was adjusted to collect the necessary data to address the research questions and hypotheses without promoting survey fatigue or reduced response rates (Sánchez-Fernández et al., 2012).

After receiving IRB approval # 06-02-15-0280493, I began collecting data. I continued inviting participants until I reached my required sample size. From late July to December 2015, I invited 393 blog authors, blog readers, and blog comment authors from English-speaking mathematics teachers' blogs available on public vCoP to participate, building a sample of 104 participants. First, I gave a short presentation at Twitter Math Camp in Riverside, California, inviting the 200 attendees to participate. I sent a reminder Tweet 1 week following the conference and ultimately 53 attendees completed the survey. Sixty-three reflective math bloggers were invited by email and reminded with a follow-up email at one week, assembling 15 participants. In October 2015, I gave a PD session for 30 middle school math teachers in SSD describing vCoP and how to use the MTBoS search engine. Seventeen teachers responded to a follow-up email invitation to the survey. Finally, in November 2015, I tweeted invitations to 100 math teacher bloggers from the MTBoS blog list. The 19 responses brought my sample size to 104, exceeding the 100 required for the study. In December, I stopped sending invitations to the survey and calculated a final response rate of 26.4%.

Descriptive Statistics for Participant Demographics

The study involved blog authors, blog readers, and blog comment authors from English-speaking mathematics teachers' blogs available on public vCoP, building a sample of 104 participants. My survey began with participants recording the name of the blog to which the survey referred and their nickname. This allowed me to insure responses referred to reflective mathematics blogs. These initial questions were followed by five demographic questions. These questions were asked to determine gender, location, years of experience in vCoP, level of experience with blogging, and type of participation.

Table 2 displays the demographic data, including gender. Sixty-three participants (60.6%) indicated female and 41 participants indicated male (39.4%) on the survey. Although an option was provided, no one declined to provide gender. These data were similar to SSD, where 65% of the middle school math teachers were female and 35% were male. A fill-in-the-blank question asked participants' to supply their home country. Respondents were primarily from the United States (89.4%), but also included teachers from the United Kingdom (5.8%), Canada (3.8%), and Australia (1%). In SSD, 86.9% of middle school math teachers completed their teaching credentials in the United States (Smith, 2016).

Participants indicated their years of experience by completing the sentence, "I have been actively blogging for . . ." Radio buttons included choices in 2 year increments. Forty-six participants (44.2%) indicated they have been blogging for less than 2 years. Thirty-one participants (29.8%) chose 2 to 3 years. Seventeen participants (16.3%) chose 4 to 5 years. Five participants (4.8%) chose 6 to 7 years. Finally, five participants (4.8%) indicated they have been blogging for more than 7 years. Supporting the conjecture that reflective blogging to improve instruction is a recent phenomenon, 74% of the participants had been blogging less than 4 years.

[[The above was the last page I edited thoroughly, so please be sure to continue through this chapter and make the appropriate changes, as they are indicated above.]]

Next, participants were asked to describe their “experience with mathematics teaching blogs” by choosing a radio button indicating one of four levels of experience. Approximately 40% of the participants indicated little experience with 13 (12.5%) choosing “Inexperienced” and 29 (27.9%) choosing “Beginner.” Thirty-seven participants (35.6%) chose “Intermediate.” Twenty-five participants (24%) indicated their level as “Advanced.” All 17 of the SSD teachers who completed the survey following the introductory workshop indicated either “Inexperienced” or “Beginner.” These findings support the initial conjecture that SSD middle school math teachers currently have little experience with using reflective math teacher blogs to improve instruction.

The final demographic question was designed to determine if the teachers were generative or receptive members of the vCoP. Generative users accounted for 81.8% of respondents with 79 participants (76%) identifying themselves as blog authors and five participants (4.8%) identifying themselves as blog commenters. Through in-person invitations and reflective math teacher bloggers posting the invitations on their blog, I also received responses from 20 (19.2%) blog readers. These receptive members of the vCoP can also improve their instruction through reading and implementing suggestions within their own classrooms (Blitz, 2013).

Measures

The independent variables measured participants' acceptance of social media (performance expectancy, effort expectancy, social influence, facilitating conditions, and computer anxiety) and participants' motivation to use social media (intrinsic motivation, perceived autonomy, experienced competence, and perceived relatedness). The dependent variables measured participants' social media use intention, social media use behavior (participation in vCoP), and intrinsic motivation (see Table 2). Intrinsic motivation and social media use intention acted as both dependent variables and predictor variables of social media use behavior (participation in vCoP).

Table 2

Identifying and Describing the Variables

Variable	Type	Scale	Description	Theoretical Framework
Performance Expectancy	Independent	Interval	Degree of belief that using the technology will help the user make gains in job performance	UTAUT
Effort Expectancy	Independent	Interval	Measure of expectation that using the technology will decrease the effort required to teach	UTAUT
Social Influence	Independent	Interval	Perception that people who an individual considers important support acceptance and use of the technology	UTAUT
Facilitating Conditions	Independent	Interval	Perception of environmental factors that are designed to counteract obstacles to technology use	UTAUT
Technology Anxiety	Independent	Interval	Affective outlook toward using the technology	UTAUT
Social Media Use Intention	Dependent/ Independent	Interval	Disposition to use the technology for a specific task	UTAUT
Social Media Use Behavior	Dependent	Interval	Actual use of the technology for a specific task	UTAUT
Intrinsic Motivation	Dependent/ Independent	Interval	Innate desire for new and challenging experiences	SDT
Perceived Autonomy	Independent	Interval	Desire to self-regulate interaction with the technology	SDT
Experienced Competence	Independent	Interval	Awareness that one can effectively use the technology	SDT
Perceived Relatedness	Independent	Interval	Belief that one shares a connection to other users of the technology	SDT

***Note*. Unified theory of acceptance and use of technology (UTAUT) and Self-determination theory (SDT).**

When a quantitative researcher chooses a nonprobability sampling technique, extra care must be taken to reduce external validity threats (Vogt, 2007). Collecting and analyzing demographic data helped me understand how my nonrandom purposeful sample represented the population of English-speaking reflective mathematics teacher bloggers. Demographic data measured the name of blog and the participants' nicknames, gender, country of residence, time and expertise, and type of participation in vCoP (see Table 3).

Table 3

Demographic Data to Describe the Participants

Construct	**Type**	**Scale**	**Description**
Name of Blog	Demographic	Nominal	Identification of the vCoP
Nickname	Demographic	Nominal	Participant's pseudonym
Gender	Demographic	Nominal	Participant's gender
Country of Residence	Demographic	Nominal	Participant's home country
Time in vCoP	Demographic	Interval	Length of time in years in vCoP
Level of Expertise	Demographic	Ordinal	Self-reported expertise in vCoP
Type of Participation	Demographic	Ordinal	Self-reported as blog author, commenter, or reader

Instrumentation and Materials

The study employed two data collection methods. The first was an automated analysis (Dascălu, Trăușan-Matu, & Dessus, 2010) that measured social media use behavior, specifically participation in vCoP (that is, writing blog articles and comments). The ReaderBench tool was used to analyze the intensity of the reflective mathematics teacher's participation in vCoP by the automated counting of the number of initiated posts, number of comments, and average length of initiated comment threads (Nistor et al., 2015b).

The second method was a 16 question online survey posted through Google Drive that measured all other variables. The survey consisted of six demographic questions adapted from Nistor et al. (2014a); six acceptance factor and social media use intention questions adapted from the UTAUT survey (Venkatesh et al., 2003); and four motivation factor questions adapted from the SDT survey (Sørebø et al., 2009; see Appendix B). The independent variables of perceived autonomy, experienced competence, and perceived relatedness were measured by an adaptation of the Basic Needs Satisfaction at Work Scale (Baard, Deci, & Ryan, 2004) and intrinsic motivation was measured with an adaptation of the Ryan and Connell's (1989) Academic Self-Regulation Questionnaire (Sørebø et al., 2009). Demographic data included nominal scales measuring name of blog, nickname of participant, gender, and country of residence; and an interval scale measuring age. According to Lodico et al. (2010), nominal scales are used to measure categorical data expressing discrete categories, such as gender. Expertise and time in the vCoP was self-evaluated and self-reported. Expertise included a discrete ordinal scale of inexperienced, beginner, intermediate, advanced, or expert. Time in the vCoP included a continuous interval scale of 2-year increments. Additionally, participants responded to a multiple-option radio button question about their type of participation, self-reporting as a blog author, blog commenter, and/or a blog reader.

Acceptance factors and use intention were measured by Venkatesh et al.'s (2003) UTAUT instrument. The survey was first published in *MIS Quarterly* in 2003. Permission has been sought and granted by email from the publishing journal and the corresponding author (see Appendix A). As outlined in the literature review, the UTAUT framework was the most appropriate measure of the technology acceptance constructs in this study. The survey consists of Likert scales measuring the independent variables of performance expectancy (*ICR* = 0.92), effort expectancy (*ICR* = 0.91), social influence (*ICR* = 0.88), facilitating conditions (*ICR* = 0.87), and computer anxiety (*ICR* = 0.83) as well as the dependent variable of use intention (*ICR* = 0.92; Venkatesh et al., 2003). The Likert scales, consisting of three to five Likert items using a 7-point scale from *strongly disagree* to *strongly agree* are treated as continuous interval measures (Brown, 2011).

In the midst of data collection, I determined that the second technology anxiety construct (TA2) contained a typographical error, which significantly altered the meaning of the question. Therefore, this construct was removed from the survey prior to data analysis. The third facilitating conditions construct (FC3) was a negatively worded question. Therefore, I reversed the responses before beginning data analysis.

To revalidate the survey instruments proposed by Venkatesh et al. (2003) in the setting of informal vCoP, Cronbach's alpha was calculated for each construct (Vogt, 2007). Using item-total statistics, it was determined that to bring the facilitating conditions Cronbach's α above 0.7, items FC3 and FC4 needed to be removed. After this adjustment, all UTAUT variables had Cronbach's $\alpha \geq 0.7$, as noted in Table 4. These findings are consistent with Venkatesh et al. (2003).

Table 4

UTAUT Survey Subscales Descriptive Statistics and Reliability (Cronbach's α)

	Items	α	Item Mean	Item SD
	Performance expectancy (PE)	0.73		
PE1	I find this blog platform useful for exchanging ideas in the blog community		5.76	1.28
PE2	Using the blog platform enables me to exchange ideas more quickly		5.46	1.36
PE3	Using the blog platform increases my productivity in exchanging ideas		5.85	1.21
PE4	If I use this blog platform it will increase my chances of recognition in the blog community		5.35	1.38
	Effort expectancy (EE)	0.88		
EE1	My interaction with this blog platform is clear and understandable		5.67	1.25
EE2	It is easy for me to become skillful at using this blog platform		5.78	1.07
EE3	I find this blog platform easy to use		5.93	1.06
EE4	Learning to operate this blog platform is easy for me		5.83	1.05
	Social influence (SI)	0.83		
SI1	People who are important to me think I should use this blog platform		5.01	1.50
SI2	People who are important to me have been helpful in the use of this blog platform		5.08	1.53
SI3	People who are important to me have supported the use of this blog platform		5.49	1.41
	Facilitating conditions (FC)	0.87		
FC1	I have the necessary resources to use this blog platform		5.90	1.18
FC2	I have the knowledge necessary to use this blog platform		6.17	1.01
FC3	This blog platform is not compatible with other Internet tools I use		removed	
FC4	A specific person (or group) is available for assistance with difficulties when I use this blog platform		removed	
	Technology Anxiety (TA)	0.86		
TA1	I feel apprehensive about using this blog platform		2.48	1.75
TA2	When using this blog platform, it scares me to think that I could *use* a lot of information by hitting the wrong key (*typographical error)*		removed	
TA3	I hesitate to use this blog platform for fear of making mistakes I cannot correct		2.30	1.62
TA4	This blog platform is somewhat intimidating to me		2.45	1.80
	Use Intention (UI)	0.99		
UI1	I intend to use this blog platform in the next few months		6.30	1.06
UI2	I predict I will use this blog platform in the next few months		6.28	1.07
UI3	I plan to use this blog platform in the next few months		6.31	1.05

Motivation was assessed based on Ryan and Deci's (2000) SDT and using a survey adapted by Sørebø et al. (2009) in *Computers and Education* to measure the teacher participants' continued use of e-learning technology. Permission was obtained from the publisher and from the corresponding author through email to use the survey instrument (see Appendix A). The survey consists of Likert scales measuring intrinsic motivation (composite reliability = 0.95), perceived autonomy (composite reliability = 0.89), experienced competence (composite reliability = 0.80), and perceived relatedness (composite reliability = 0.81). The Likert scales, consisting of five Likert items using a 7-point scale from *strongly disagree* to *strongly agree* are treated as continuous interval measures (Brown, 2011).

Internal consistency reliability was also re-evaluated by calculating Cronbach's α for each SDT construct (Vogt, 2007). The third question of perceived autonomy (PA3) was negatively worded and so the data were reversed prior to data analysis. However, when reviewing item-total statistics, I determined that construct PA3 should be removed from the data set. At that point, all SDT variables had Cronbach's $\alpha \geq 0.7$, as noted in Table 5. These findings are consistent with Sørebø et al. (2009).

Table 5

SDT Survey Subscales and Corresponding Reliability (Cronbach's α)

	Items	α	Item Mean	Item SD
	Perceived autonomy (PA)	0.85		
PA1	On this blog platform I can decide which activities I want to practice		5.87	1.22
PA2	On this blog platform I feel that I participate in blogging activities because I want to		6.22	1.15
PA3	On this blog platform I have to force myself to do the blogging activities		removed	
PA4	On this blog platform I feel a certain freedom of action		5.77	1.31
PA5	On this blog platform I have some choice in what I want to do		6.09	1.33
	Experienced competence (EC)	0.83		
EC1	I think I am pretty good at blogging		5.09	1.52
EC2	I am satisfied with my performance at blogging		4.78	1.69
EC3	When I have participated in blogging activities for a while, I feel pretty competent		5.22	1.27
EC4	I am pretty skilled at blogging		5.15	1.37
EC5	I cannot do blogging activities very well		5.16	1.51
	Perceived relatedness (PR)	0.95		
PR1	With the other users of this blog platform, I feel supported		5.11	1.32
PR2	With the other users of this blog platform, I feel understood		5.16	1.19
PR3	With the other users of this blog platform, I feel listened to		5.18	1.36
PR4	With the other users of this blog platform, I feel valued		5.22	1.29
PR5	With the other users of this blog platform, I feel safe		5.37	1.18
	Intrinsic motivation (IM)	0.81		
IM1	I use this blogging platform because blogging is fun		5.55	1.32
IM2	I use this blogging platform because I enjoy exchanging ideas		6.04	1.10
IM3	I use this blogging platform because blogging is exciting		5.48	1.26
IM4	I use this blogging platform because of the enjoyment I feel when exchanging ideas		5.74	1.20

Data Collection and Analysis

Data Collection Process

I chose reflective mathematics blogs from the Internet, including but not limited to, those affiliated with MTBoS, *#msmathchat*, and Twitter Math Camp. The ReaderBench tool was used to determine the intensity of the participation in the vCoP (Dascălu et al., 2010). At the same time, mathematics teacher bloggers received an email or Tweet with an explanation of the study, an invitation to participate, and an URL to the actual survey. Participants were asked to read about the study, state their informed consent, and participate in a survey. Teachers consented to participate by completing and submitting the electronic survey. One week later, bloggers received a reminder email or Tweet. Additionally, a few blog authors posted an invitation to their readers to participate in the study, including a hyperlink to my blog where an explanation of the study, an invitation to participate, and an URL to the actual survey was posted. No children were targeted, and the invitation to the study clearly outlined that only adults over the age of 18 years should continue to the URL; however, it was impossible for me to verify a blogger's age.

The data were collected via an online survey posted on Google Drive and via the automated ReaderBench tool. Blogs focused on mathematics teaching were chosen from the Internet, including but not limited to, participants in MTBoS, *#msmathchat*, and Twitter Math Camp. The bloggers were invited to respond to the questionnaire described above. As long as the target number of 100 survey participants was not reached, supplementary blogs and bloggers' community were added to the sample and the procedure was repeated. When the sample reached the targeted size, data collection was completed and statistical data processing was performed.

The raw data were stored on a password-protected laptop as well as on the password-protected Google Drive site. After data analysis was completed, the deidentified data were deleted from Google Drive and will be stored for 5 years on a password-protected CD-Rom in a safe in my home office. At that time the CD-Rom will be destroyed.

Data Analysis

Data collected by the online survey and the ReaderBench tool were exported to an Excel spreadsheet and analyzed using SPSS, Version 21 for Mac. To revalidate the survey instruments proposed by Venkatesh et al. (2003) and Sørebø et al. (2009) in the setting of informal vCoP, a confirmatory analysis was performed, analyzing convergent and discriminant validity of the constructs. Internal consistency reliability was re-evaluated by calculating Cronbach's α for each construct (Vogt, 2007).

The initial descriptive data analysis served a dual role, both describing the data and identifying difficulties that will necessitate revisions to the inferential data analysis plan (Vogt, 2007). Descriptive statistics included minimum and maximum; measures of *central tendency*, such as mean; measures of *dispersion*, such as standard deviation; and measures of *association*, such as correlation coefficients (Vogt, 2007).

Many researchers use structured equation modeling (SEM) to analyze data from technology acceptance correlation studies with multiple independent variables (Chen et al., 2015; Kreijns et al., 2014; Nistor et al., 2014b; Teo, 2011; Venkatesh, 2003). Although SEM is a powerful regression analysis tool, I did not choose SEM because my sample size was not large enough. I addressed the research questions and hypotheses by conducting multiple regression analysis. Multiple linear regression allows a researcher to examine the relationships among the independent variable and many predictor variables (Muijs, 2011). Linear regression is done by graphing ordered data pairs with the independent variable on the x-axis and the dependent variable on the y-axis and trying to fit a line between the data points (Lodico et al., 2010). Multiple regression uses the same concept, but with multiple dependent variables.

Beta weight, similar to the correlation coefficient, measured the relationship between one independent variable and the dependent variable after the effects of the other independent variables are statistically removed (Vogt, 2007). The major benefit of β weights is that they offered a measure of the importance of each variable that provided an initial rank ordering of the predictive variables contribution to a multiple linear regression model (Nathans, Oswald, & Nimon, 2012). With a sample size greater than or equal to 100, such as my study, correlation coefficients between 0.20 and 0.34 represent a slight relationship and those between 0.35 and 0.64 represent a moderately strong relationship (Lodico et al., 2010).

Results

The descriptive statistics show the 102 mathematics teacher participants accepted the informal vCoP to a high degree. The mean values of performance expectancy, effort expectancy, social influence, facilitating conditions and social media use intention varied from 5.19 to 6.30 on a scale of 1 to 7. They also reported a low level of technology anxiety with a mean of 2.41 (*SD* = 1.53). Automated data was missing from 14 blog author participants. Therefore, the sample size for analysis of RQ2 and RQ4 was 91 participants. Social media use behavior varied from a score of 0 for blog readers to a maximum of 1556 for the most active blog author with a mean of 71.86 (SD = 181.66). Additionally, the participants reported high levels of motivation with mean values of intrinsic motivation, perceived autonomy, experienced competence, and perceived relatedness between 5.08 and 5.99 (see Table 6).

Table 6

Descriptive Statistics of the Variables

Variable	N	Minimum	Maximum	Mean	*SD*
Performance Expectancy	102	1.00	7.00	5.61	0.97
Effort Expectancy	102	1.00	7.00	5.80	0.96
Social Influence	102	1.00	7.00	5.19	1.28
Facilitating Conditions	102	1.00	7.00	6.03	1.03
Technology Anxiety	102	1.00	7.00	2.41	1.53
Social Media Use Intention	102	1.00	7.00	6.30	1.05
Social Media Use Behavior (Participation in vCoP)	91	0	1556	71.86	181.66
Intrinsic Motivation	102	1.00	7.00	5.99	1.03
Perceived Autonomy	102	1.60	7.00	5.08	1.14
Experienced Competence	102	1.00	7.00	5.21	1.15
Perceived Relatedness	102	1.00	7.00	5.70	0.98

Before applying multiple regression analysis to my data, I needed to check the residuals and tolerance (Vogt, 2007). First, as the name multiple linear regression implies, the relationship between each predictor variable and the dependent variable must be linear. In nonexperimental studies, such as mine, random-effects model assumptions should be applied (Green & Salkind, 2013). In linear relationships, the errors of prediction have a normal distribution (Muijs, 2011). For each research question, I plotted standardized predicted values on the x-axis and standardized residuals on the y-axis and determining a line of best fit, validated both linearity and normal distribution.

Next, I evaluated the residuals. Large residuals indicate a lack of linearity (Muijs, 2011). Case-wise diagnostics were performed to screen for outliers as identified by a standardized residual. A response is considered to be an outlier when the absolute value of the standardized residual is greater than three (Muijs, 2011). Three cases were determined to be outliers and were excluded from the data set (see Table 7).

Table 7

Case Processing Summary

Cases	***N***	**%**
Valid	102	97.1
Excluded[a]	3	2.9
Total	105	100.0

[a]List-wise deletion based on all variables in the procedure.

Finally, I evaluated the tolerance of my data. In multiple regression analysis, the predictor variables should not be strongly correlated to each other, also known as multicollinearity. Multiple regression analysis cannot effectively analyze multiple predictor variables if the variables are multicollinear (Vogt, 2007). For each of the research questions, the tolerances are all greater than or equal to 0.5, indicating no multicollinearity (see Table 8). Since the residuals and tolerance were within acceptable parameters, I performed the regression analysis for each research question.

Table 8

Tolerance Values for Predictor Variables

Criterion Variable	Predictor Variable	Tolerance
Social Media Use Intention	Performance Expectancy	0.52
Social Media Use Intention	Effort Expectancy	0.64
Social Media Use Intention	Social Influence	0.75
Social Media Use Intention	Intrinsic Motivation	0.57
Intrinsic Motivation	Perceived Autonomy	0.72
Intrinsic Motivation	Experienced Competence	0.64
Intrinsic Motivation	Perceived Relatedness	0.72
Participation in vCoP (Use Behavior)	Social Media Use Intention	0.67
Participation in vCoP (Use Behavior)	Technology Anxiety	0.61
Participation in vCoP (Use Behavior)	Facilitating Conditions	0.56
Participation in vCoP (Use Behavior)	Intrinsic Motivation	0.75

Social Media Use Intention as the Dependent Variable

Social media use intention was examined as a dependent variable by using multiple linear regression on the predictor variables in technology acceptance (Research Question 1) and motivation (Research Question 3). Through Research Question 1, I asked, “To what extent does social media acceptance predict reflective mathematics teacher bloggers’ social media use intention and participation in vCoP?” Through Research Question 3, I asked, “To what extent does intrinsic motivation predict reflective mathematics teacher bloggers’ social media use intention? To examine these questions, I developed the following null hypotheses:

$H_0$1a: Performance expectancy does not predict reflective mathematics teacher bloggers' social media use intention.

$H_0$1b: Effort expectancy does not predict reflective mathematics teacher bloggers' social media use intention.

$H_0$1c: Social influence does not predict reflective mathematics teacher bloggers' social media use intention.

$H_0$3: Intrinsic motivation does not predict reflective mathematics teacher bloggers' social media use intention.

I conducted a multiple linear regression analysis to examine if performance expectancy, effort expectancy, social influence, and intrinsic motivation predicted social media use intention in the environment of an informal vCoP, specifically reflective mathematics teacher blogs. To validate the linearity of each predictor variable and the criterion variable, I created a scatterplot and calculated a line of best fit for the data. The graph and regression equation verified the linearity of performance expectancy and social media use intention (see Figure 5). The graph and regression equation also verified the linearity of effort expectancy and social media use intention (see Figure 6). The graph and regression equation verified the linearity of social influence and social media use intention (see Figure 7). And finally, the graph and regression equation verified the linearity of intrinsic motivation and social media use intention (see Figure 8).

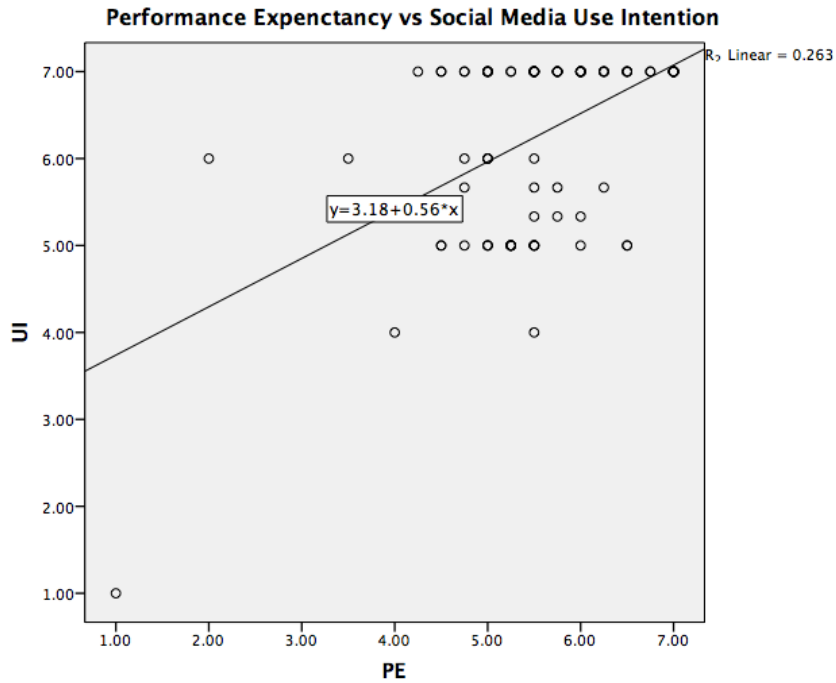


Figure 5. Scatterplot showing linearity between performance Expectancy (PE) and social media use intention (UI).

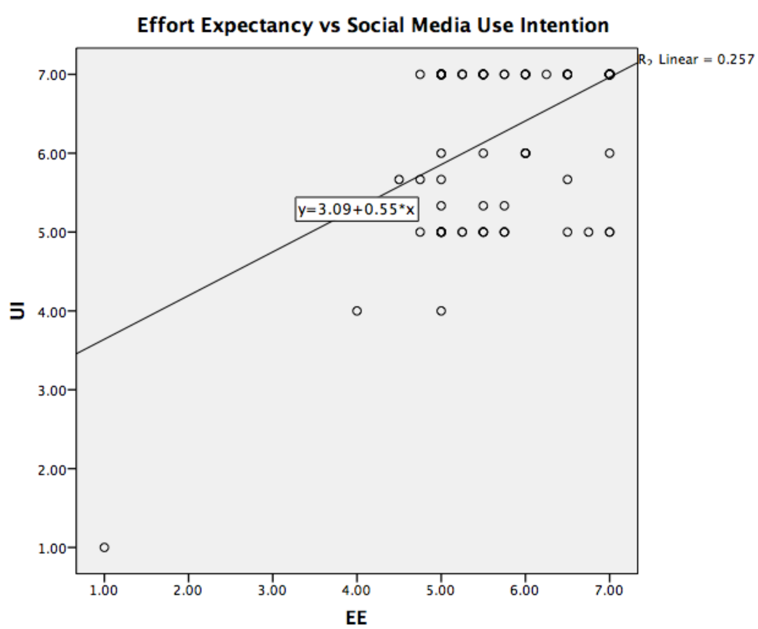


Figure 6. Scatterplot showing the linearity between effort expectancy (EE) and social media use intention (UI).

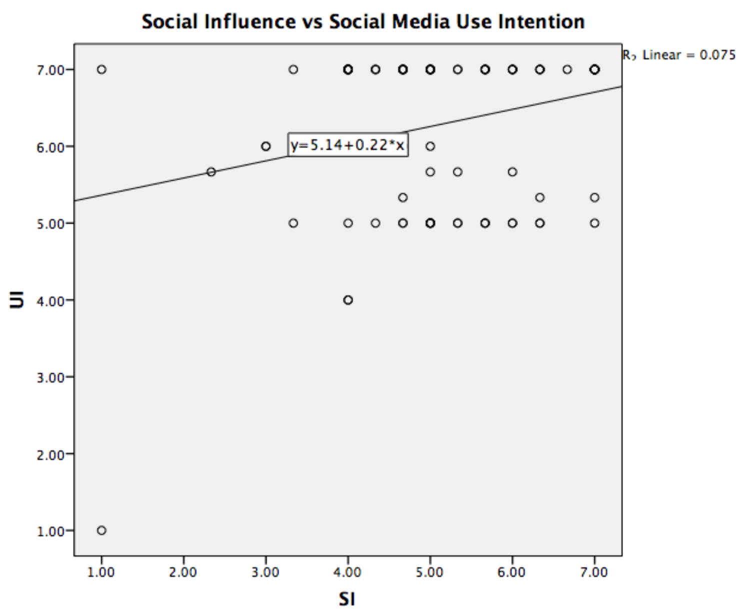


Figure 7. Scatterplot showing linearity between social influence (SI) and social media use intention (UI).

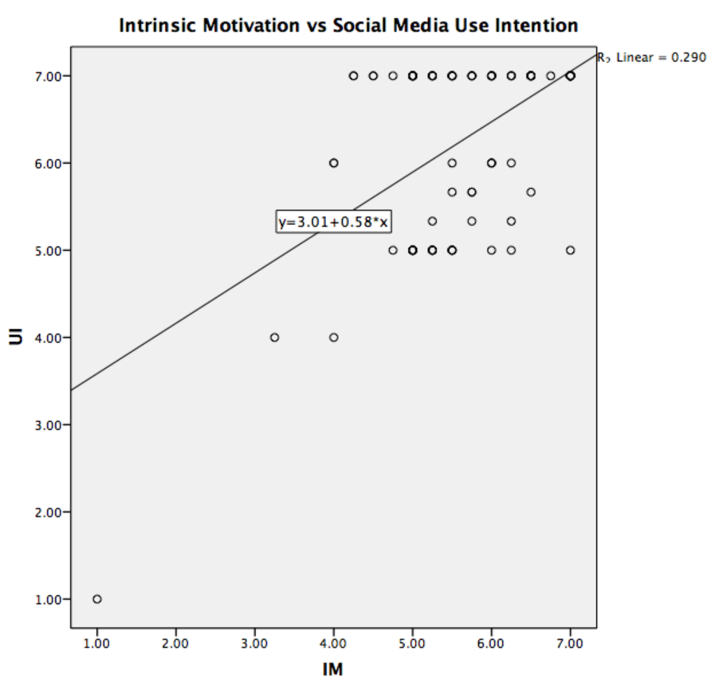


Figure 8. Scatterplot showing linearity between intrinsic motivation and social media use intention.

Normal Distribution of Residuals. For each dependent variable, I plotted the regression standardized predicted value against the standardized residual to verify the linearity and normal distribution of the data (Green & Salkind, 2013). A line of best fit was then calculated. For the dependent variable of Research Questions 1 and 3, social media use intention, the scatterplot shows this relationship and validates the assumptions of linearity and normal distribution (see Figure 9).

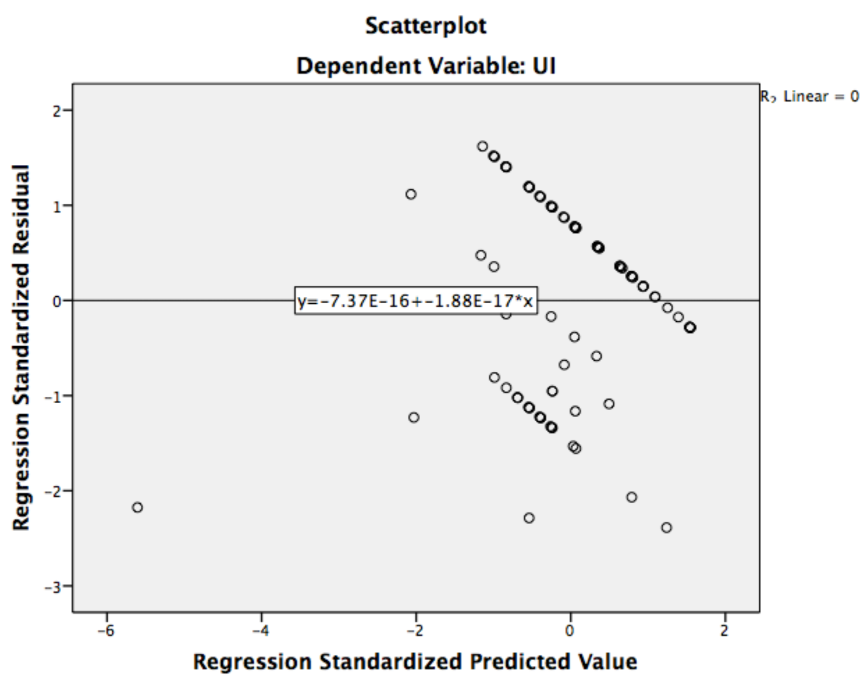


Figure 9. Scatterplot of standardized predicted value and standardized residual for social media use intention (UI).

Null hypotheses. The analysis of the constructs of performance expectancy, effort expectancy, social influence, and intrinsic motivation and the criterion construct of social media use intention revealed the significance (*p*-value) to answer the null hypotheses for Research Questions 1 and 3. The significance level of $p < 0.05$ for performance expectancy indicated a significant relationship between performance expectancy and social media use intention. I rejected the null hypothesis, $H_0$1a: Performance expectancy does not predict reflective mathematics teacher bloggers' social media use intention. The significance level of $p < 0.05$ for effort expectancy indicated a significant relationship between effort expectancy and social media use intention. I rejected the null hypothesis, $H_0$1b: Effort expectancy does not predict reflective mathematics teacher bloggers' social media use intention. The significance level of $p = 0.90$ for social influence did not indicate a significant relationship between social influence and social media use intention. I was unable to reject the null hypothesis, $H_0$1c: Social influence does not predict reflective mathematics teacher bloggers' social media use intention. The significance level of $p = 0.01$ for intrinsic motivation indicated a significant relationship between intrinsic motivation and social media use intention. I rejected the null hypothesis, $H_0$3: Intrinsic motivation does not predict reflective mathematics teacher bloggers' social media use intention. The R squared value of 0.39 indicated that performance expectancy, effort expectancy, social influence, and intrinsic motivation accounts for approximately 39% of the variance of social media use intention and is a moderate fit.

Performance Expectancy. For the predictor variable, performance expectancy, the descriptive statistics showed a mean of 5.61 and a standard deviation of 0.97, which is similar to the standard deviation of the predictor variable, effort expectancy at 0.96. With a sample size greater than or equal to 100, such as my study, correlation coefficients between 0.20 and 0.34 represent a slight relationship (Lodico et al., 2010). The construct, performance expectancy, had a β weight of 0.23 with a significance level of 0.04.

Therefore, performance expectancy is a significant predictor of social media use intention for reflective mathematics teacher bloggers (see Table 9).

Effort Expectancy. For the predictor variable, effort expectancy, the descriptive statistics showed a mean of 5.80 and a standard deviation of 0.96, which is similar to the standard deviation of the predictor variable, performance expectancy at 0.97. The construct, effort expectancy, had a β weight of 0.24 with a significance level of 0.02. Therefore, effort expectancy is a significant predictor of social media use intention for reflective mathematics teacher bloggers (see Table 9).

Social Influence. For the predictor variable, social influence, the descriptive statistics showed a mean of 5.19 and a standard deviation of 1.28, which is greater than the standard deviation of the other predictor variables. The construct, social influence, had a β weight of -0.01 with a significance level of 0.90. Therefore, social influence is not shown to be a significant predictor of social media use intention for reflective mathematics teacher bloggers (see Table 9).

Intrinsic Motivation. For the predictor variable, intrinsic motivation, the descriptive statistics showed a mean of 5.99 and a standard deviation of 1.03, which is greater than the standard deviation of performance expectancy and effort expectancy. The construct, intrinsic motivation, had a β weight of 0.28 with a significance level = 0.01. Therefore, intrinsic motivation is a significant predictor of social media use intention for reflective mathematics teacher bloggers (see Table 9).

Table 9

Regression Coefficients for Use Intention as the Dependent Variable

Predictor Variable	β	*p*	R^2
Performance Expectancy	0.23	0.04	0.39
Effort Expectancy	0.24	0.02	
Social Influence	-0.01	0.90	
Intrinsic Motivation	0.28	0.01	

Social Media Use Behavior as the Dependent Variable

Social media use behavior was examined as a dependent variable by using multiple linear regression on the predictor variables in technology acceptance (Research Question 2) and motivation (Research Question 4). Through Research Question 2, I asked, "To what extent do social media use intention, facilitating conditions, and technology anxiety predict reflective mathematics teacher bloggers' participation in vCoP?" Through Research Question 4, I asked, "To what extent does intrinsic motivation predict reflective mathematics teacher bloggers' participation in vCoP?" To examine these questions I developed the following null hypotheses:

$H_0$2a: Social media use intention does not predict reflective mathematics teacher bloggers' participation in vCoP.

$H_0$2b: Facilitating conditions do not predict reflective mathematics teacher bloggers' participation in vCoP.

$H_0$2c: Technology anxiety does not predict reflective mathematics teacher bloggers' participation in vCoP.

$H_0$4: Intrinsic motivation does not predict reflective mathematics teacher bloggers' social participation in vCoP.

I conducted a multiple linear regression analysis to examine if social media use intention, facilitating conditions, technology anxiety, and intrinsic motivation predict social media use behavior in the environment of an informal vCoP, specifically reflective mathematics teacher blogs. To validate the linearity of each predictor variable and the criterion variable, I created a scatterplot and calculated a line of best fit for the data. The graph and regression equation verified the linearity of facilitating conditions and social media use behavior (see Figure 10). The graph and regression equation also verified the linearity of technology anxiety and social media use behavior (see Figure 11). The graph and regression equation verified the linearity of social media use intention and social media use behavior (see Figure 12). And finally, the graph and regression equation verified the linearity of intrinsic motivation and social media use behavior (see Figure 13).

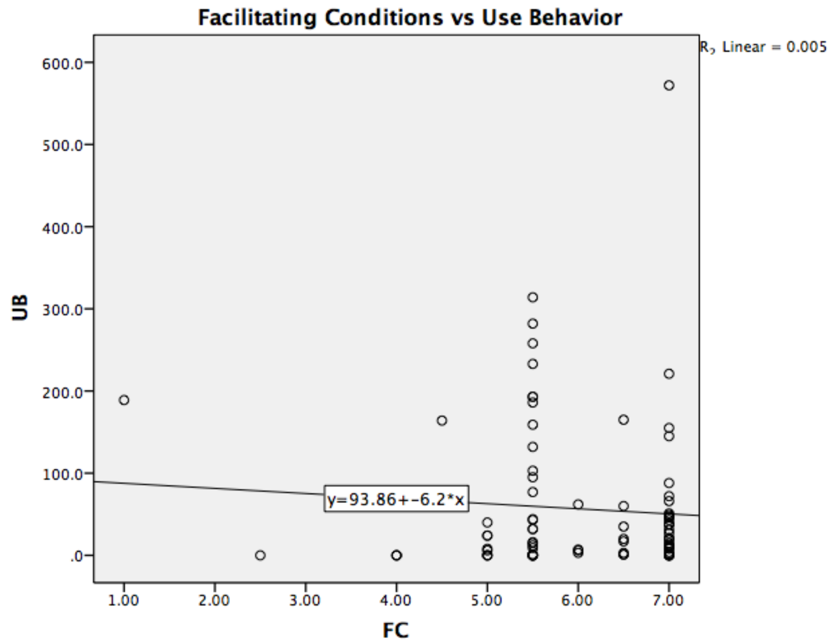


Figure 10. Scatterplot showing linearity between facilitating conditions and social media use behavior.

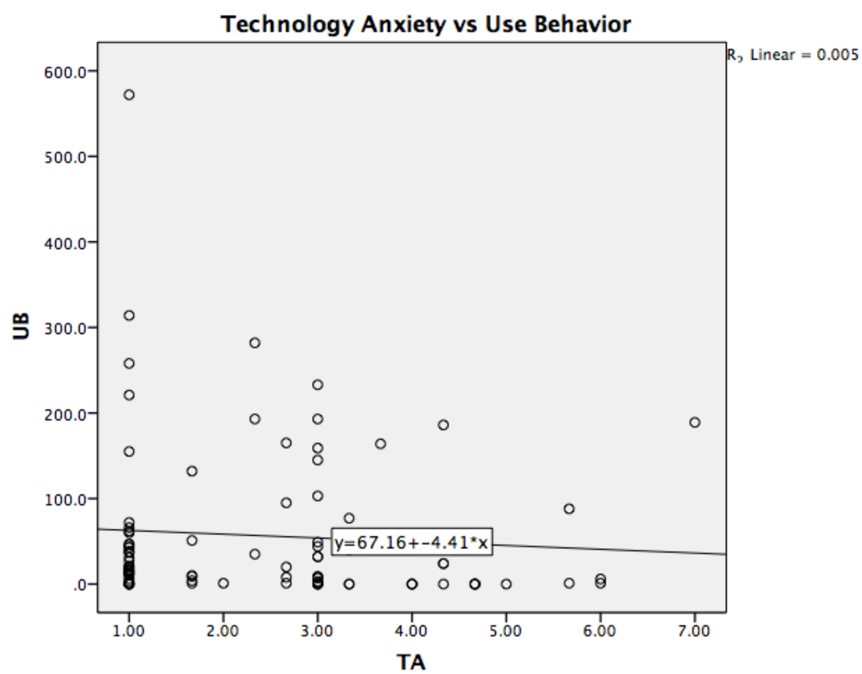


Figure 11. Scatterplot showing linearity between technology anxiety and social media use behavior.

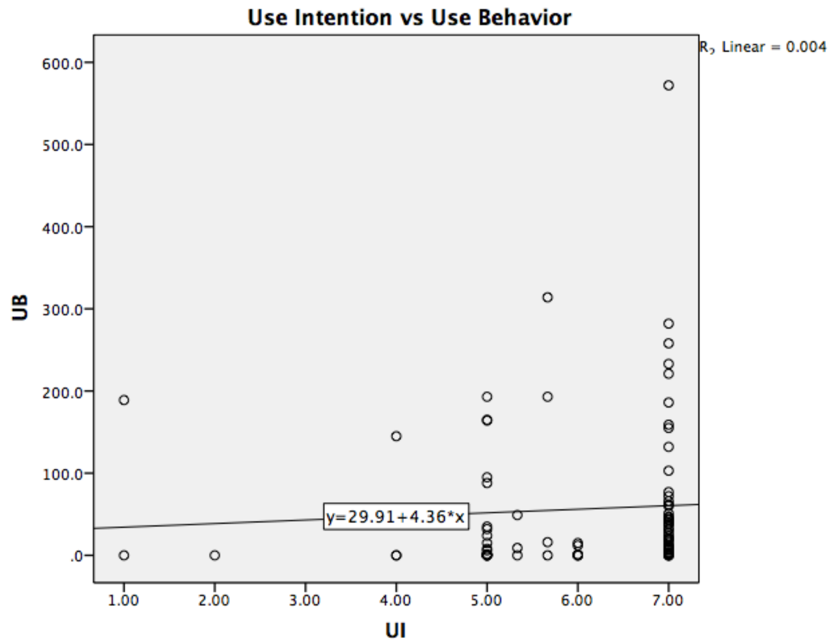


Figure 12. Scatterplot showing linearity between social media use intention and social media use behavior.

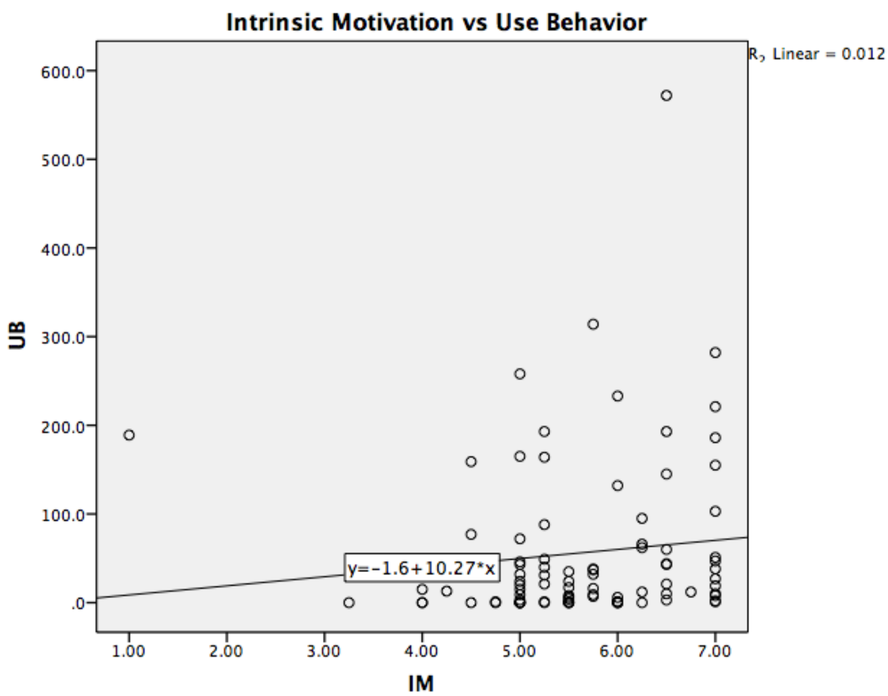


Figure 13. Scatterplot showing linearity between intrinsic motivation and social media use behavior.

Normal Distribution of Residuals. For the dependent variable, social media use behavior, I plotted the regression standardized predicted value against the standardized residual. A line of best fit was then calculated. The scatterplot shows this relationship and validates the assumptions of linearity and normal distribution (see Figure 14).

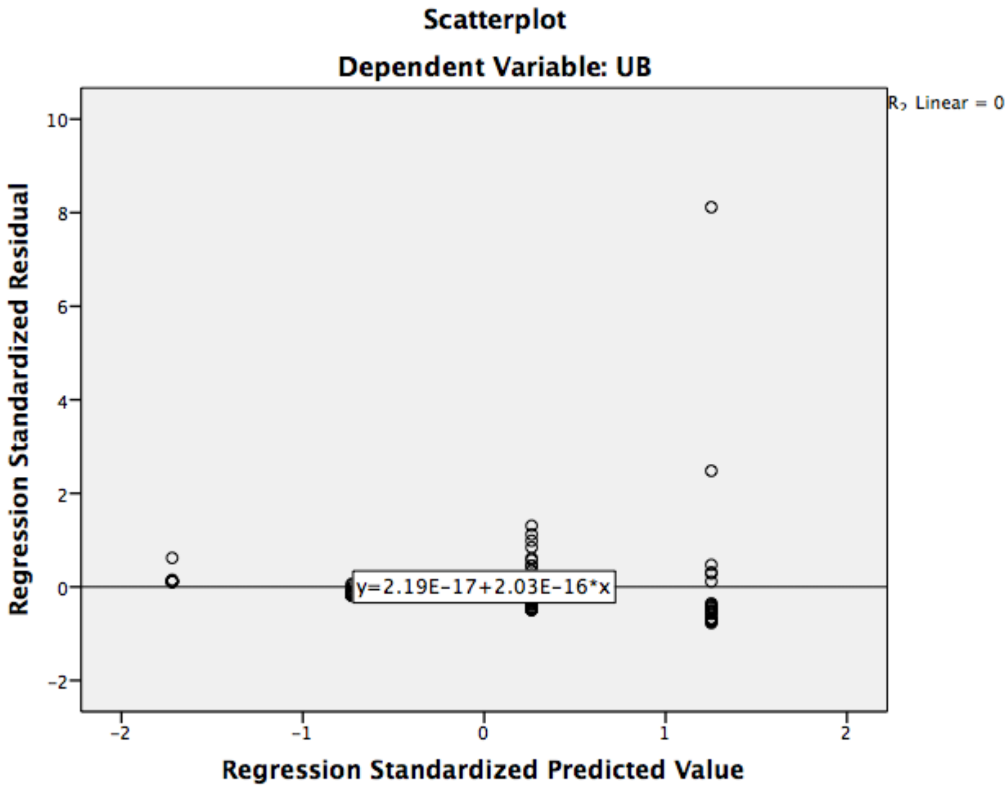


Figure 14. Scatterplot of standardized predicted value and standardized residual for Use Behavior as the Dependent Variable

Null hypotheses. The analysis of the constructs of social media use intention, facilitating conditions, technology anxiety, and intrinsic motivation and the criterion construct of social media use behavior revealed the significance (*p*-value) to answer the null hypotheses for Research Questions 2 and 4. The significance level of $p = 0.55$ for social media use intention did not indicate a significant relationship between social media use intention and social media use behavior. I was unable to reject the null hypothesis,

$H_0$2a: Social media use intention does not predict reflective mathematics teacher bloggers' participation in vCoP. The significance level of $p = 0.09$ for facilitating conditions did not indicate a significant relationship between facilitating conditions and use behavior. I was unable to reject the null hypothesis, $H_0$2b: Facilitating conditions do not predict reflective mathematics teacher bloggers' participation in vCoP. The significance level of $p = 0.25$ for technology anxiety did not indicate a significant relationship between technology anxiety and social media use behavior. I was unable to reject the null hypothesis, $H_0$2c: Technology anxiety does not predict reflective mathematics teacher bloggers' participation in vCoP. The significance level of $p = 0.32$ for intrinsic motivation did not indicate a significant relationship between intrinsic motivation and social media use behavior. I was unable to reject the null hypothesis, $H_0$4: Intrinsic motivation does not predict reflective mathematics teacher bloggers' social participation in vCoP.

Social Media Use Intention, Facilitating Conditions, Technology Anxiety, and Intrinsic Motivation. For the independent variable social media use intention, the descriptive statistics showed a mean of 6.30 (SD = 1.05). The construct, social media use intention, had a β weight of 0.08 with a significance level of 0.55. Facilitating Conditions had a mean of 6.03 (SD = 1.03). The construct, facilitating conditions had a β weight of -0.25 with a significance level of 0.09. The independent variable technology anxiety showed a mean of 2.41 (SD = 1.53). The construct, technology acceptance, had a β weight of -0.15 with a significance level of 0.25. In predicting social media use behavior, intrinsic motivation had a β weight = 0.08 and a significance level of 0.32. Therefore, the predictor variables, social media use intention, facilitating conditions, technology anxiety, and intrinsic motivation are not shown to be a significant predictor of social media use behavior for reflective mathematics teacher bloggers. The R squared value of 0.05 indicated that social media use intention, facilitating conditions, technology anxiety, and intrinsic motivation accounts for only 5% of the variance of social media use behavior and are a poor fit (see Table 10).

Table 10

Regression Coefficients for Social Media Use Behavior as the Dependent Variable

Predictor Variable	β	*p*	R^2
Social Media Use Intention	0.08	0.55	0.05
Facilitating Conditions	-0.25	0.09	
Technology Anxiety	-0.15	0.25	
Intrinsic Motivation	0.08	0.32	

Intrinsic Motivation as the Dependent Variable

Through Research Question 5, I asked, “To what extent do perceived autonomy, experienced competence and perceived relatedness predict reflective mathematics teacher bloggers’ intrinsic motivation?” To examine this question, I created three null hypotheses:

$H_0$5a: Perceived autonomy does not predict reflective mathematics teacher bloggers’ intrinsic motivation.

$H_0$5b: Experienced competence does not predict reflective mathematics teacher bloggers’ intrinsic motivation.

$H_0$5c: Perceived relatedness does not predict reflective mathematics teacher bloggers' intrinsic motivation.

I conducted a multiple linear regression analysis to examine if perceived autonomy, experienced competence, and perceived relatedness predicted intrinsic motivation in the environment of an informal vCoP, specifically reflective mathematics teacher blogs.

Linearity. To validate the linearity of each predictor variable and the criterion variable, I created a scatterplot and calculated a line of best fit for the data. The scatterplots allowed a visual representation, while the regression equation provided a numeric representation of each linear relationship. The graph and regression equation verified the linearity of perceived autonomy and intrinsic motivation (see Figure 15). The graph and regression equation also verified the linearity of experienced competence and intrinsic motivation (see Figure 16). And finally, the graph and regression equation verified the linearity of perceived relatedness and intrinsic motivation (see Figure 17).

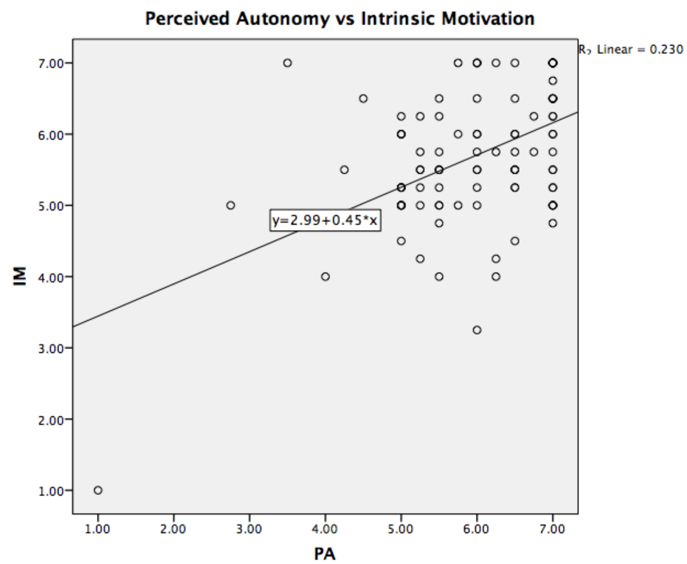


Figure 15. Scatterplot showing linearity between perceived autonomy and intrinsic motivation.

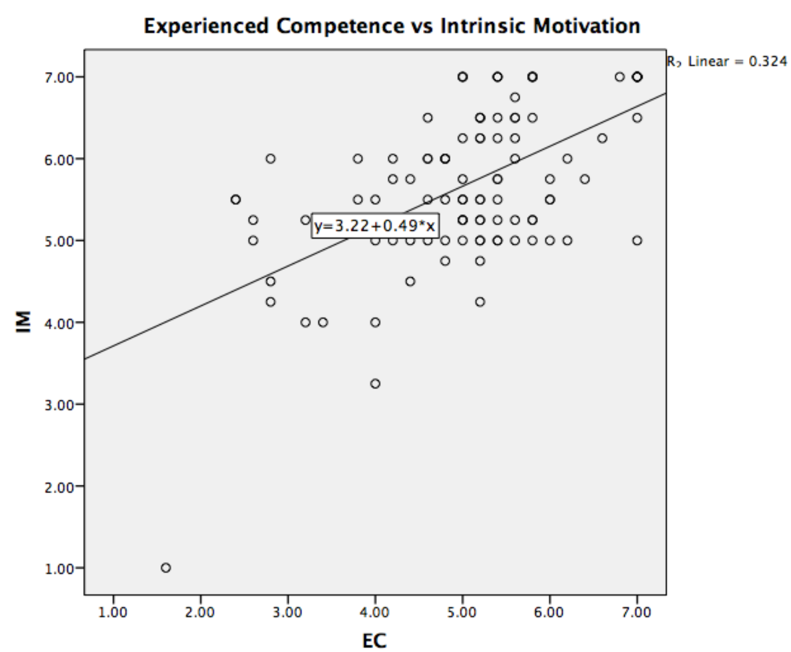


Figure 16. Scatterplot showing linearity between experienced competence and intrinsic motivation.

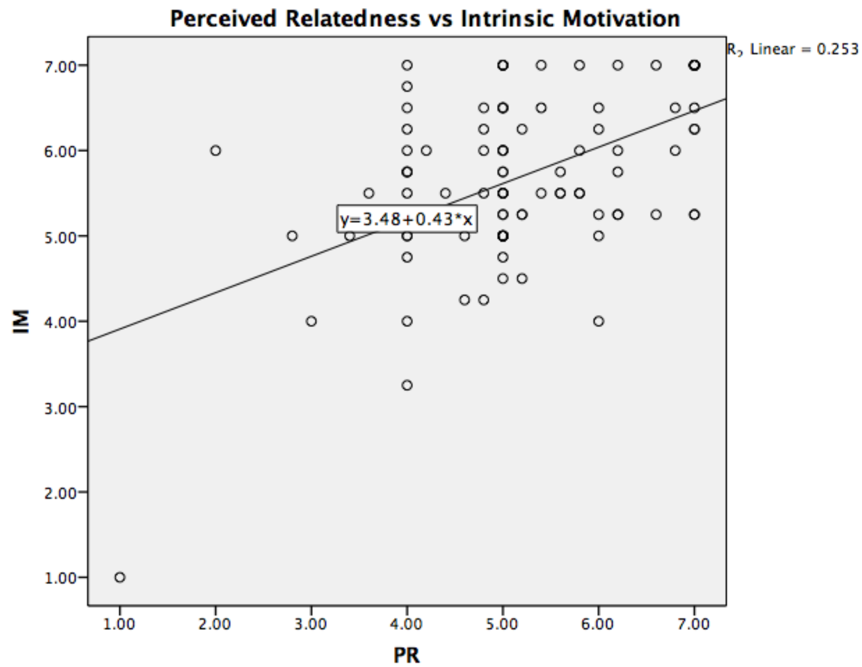


Figure 17. Scatterplot showing linearity between perceived relatedness and intrinsic motivation.

Normal Distribution of Residuals. For each dependent variable, I plotted the regression standardized predicted value against the standardized residual to verify the linearity and normal distribution of the data (Green & Salkind, 2013). A line of best fit was then calculated. For the dependent variable of Research Question 5, intrinsic motivation (IM), the scatterplot shows this relationship and validates the assumptions of linearity and normal distribution (see Figure 18).

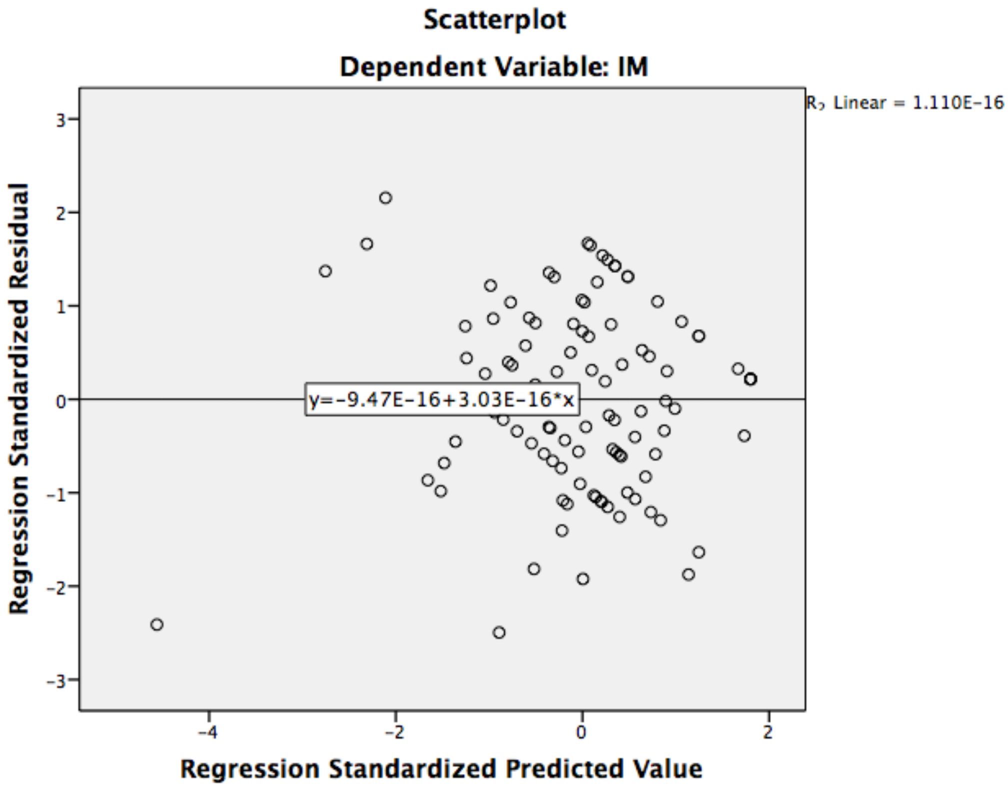


Figure 18. Scatterplot of predicted value and standardized residual showing linearity.

Null hypotheses. The analysis of the constructs of perceived autonomy, experienced competence, and perceived relatedness and the criterion construct of intrinsic motivation revealed the β weight and significance (*p*-value) to answer the null hypotheses for Research Question 5. The significance level of $p < 0.05$ for perceived autonomy indicated a moderately significant relationship between perceived autonomy and intrinsic motivation. I rejected the null hypothesis, $H_0$5a: Perceived autonomy does not predict reflective mathematics teacher bloggers' intrinsic motivation. The significance level of $p < 0.01$ for experienced competence indicated a significant relationship between experienced competence and intrinsic motivation. I rejected the null hypothesis, $H_0$5b: Experienced competence does not predict reflective mathematics teacher bloggers' intrinsic motivation. The significance level of $p = 0.01$ for perceived relatedness indicated a significant relationship between perceived relatedness and intrinsic motivation. I rejected the null hypothesis, $H_0$5c: Perceived relatedness does not predict reflective mathematics teacher bloggers' intrinsic motivation. The *R squared* value of 0.42 indicated that perceived autonomy, experienced competence, and perceived relatedness accounts for approximately 42% of the variance of intrinsic motivation and is a moderate fit.

Perceived Autonomy. For the predictor variable, perceived autonomy, the descriptive statistics showed a mean of 5.99 and a standard deviation of 1.03, which is less than the standard deviations of the predictor variables, experienced competence (1.13) and perceived relatedness (1.15). The construct, perceived autonomy, had a β weight of 0.21 and a significance level of 0.02. Therefore, perceived autonomy is a significant predictor of intrinsic motivation for reflective mathematics teacher bloggers (see Table 11).

Experienced competence. For the predictor variable, experienced competence, the descriptive statistics showed a mean of 5.08 and a standard deviation of 1.13, which is less than the standard deviation of the predictor variables, perceived relatedness (1.15) and greater than the standard deviation of perceived autonomy (0.98). The construct, experienced competence, had a β weight of 0.34 and a significance level of 0.00. Therefore, experienced competence is a significant predictor of intrinsic motivation for reflective mathematics teacher bloggers (see Table 11).

Perceived Relatedness. For the predictor variable, perceived relatedness, the descriptive statistics showed a mean of 5.21 and a standard deviation of 1.15, which is greater than the standard deviations of the predictor variables, experienced competence (1.13) and perceived autonomy (0.98). The construct, perceived relatedness, had a β weight of 0.25 and a significance level of 0.01. Therefore, perceived relatedness is a significant predictor of intrinsic motivation for reflective mathematics teacher bloggers (see Table 11).

Table 11

Regression Coefficients for Intrinsic Motivation as the Dependent Variable

Predictor Variable	β	*p*	R^2
Perceived Autonomy	0.21	0.02	0.42
Experienced Competence	0.34	0.00	
Perceived Relatedness	0.25	0.01	

Discussion

In this study, I investigated acceptance factors and motivation factors as potentially predictive constructs of reflective mathematics teacher bloggers' social media use intention and participation in vCoP, specifically reflective blogging to improve instruction. The US Department of Education actively encourages teachers to participate in informal vCoP, furthering its stated aim of "expanding opportunities for teachers to reflect and collaborate without the usual limitations of time, space, and pace" (Blitz, 2013, p. i). Understanding the factors that predict a math teachers' use intention and behavior allowed me to develop a targeted PD module to encourage these factors. Using multiple regression analysis, I investigated my research questions and evaluated my hypotheses. In this section, I discuss the overall results of my study, considering my research questions together as a model of social media use intention and use behavior (See Figure 17).

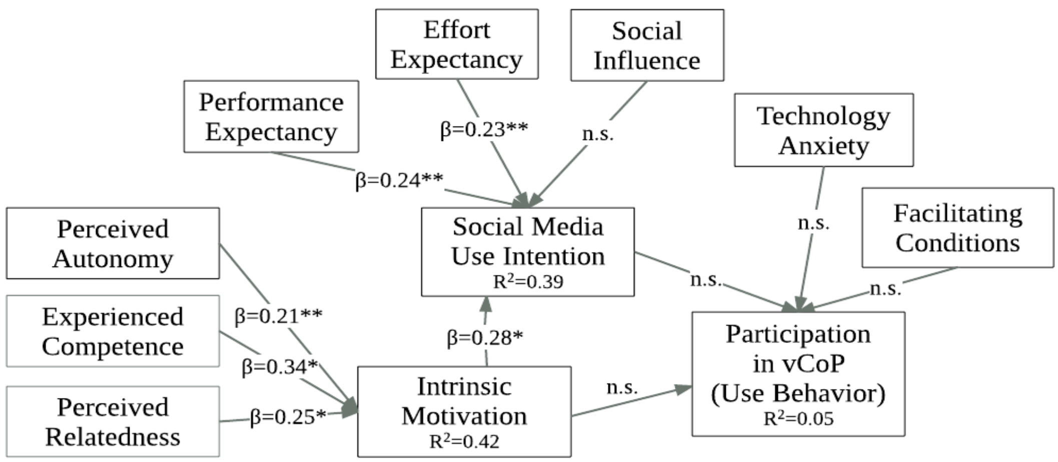


Figure 19: Regression of the research model
(*$p < 0.01$, **$p < 0.05$)

Technology Acceptance Factors and Social Media Use Intention

Regression analysis revealed that performance expectancy and effort expectancy were significant predictors of social media use intention. These correlations confirmed the original UTAUT findings of Venkatesh et al. (2003, 2012) who found performance expectancy to be the strongest predictor construct. These findings also supported Nistor et al. (2014a) who concluded that UTAUT was replicated with both performance and effort expectancy being significant predictor constructs of participants' technology use intention. Performance expectancy was also found to be a significant predictor of use intention by Pynoo et al.'s (2011) study of secondary teachers' use intention.

Venkatesh et al. (2003) found that social influence was statistically significant in mandatory technology use environments but not significant in voluntary ones. Pynoo et al. (2011) found that social influence was a significant factor in a study of a mandatory program by secondary teachers. In my study the result was typical of Venkatesh et al.'s (2003) findings that social influence was not a significant predictive factor of social media use intention in voluntary settings. The math teachers collaborate in MTBoS blogs on their own time outside of the workday influences of peers and administrators. Teachers in SSD who participate in reflective blogging will also be outside of the workday influences of peers and administrators in a voluntary setting. Venkatesh et al. (2003) and my findings would suggest that social influence would therefore not be a significant predictive factor of mathematics teachers' participation in an informal vCoP.

Intrinsic Motivation and Social Media Use Intention

Regression analysis revealed that intrinsic motivation was also a predictive factor of social media use intention. These findings support Sørebø et al. (2009), Ahrony (2014), Gorozidis and Papaioannou (2014), Kreijns et al. (2014), and Zhou (2016) who each corroborated intrinsic motivation as a significant factor of use intention. Teacher participants who possess a high level of intrinsic motivation and accordingly high use intention have a "sense of unpressured willingness to engage" in the technology (Sørebø et al. 2009, p. 1185). Therefore, the PD module I created to encourage SSD math teachers to participate in informal vCoP to improve instruction includes elements of choice and specific examples of how blogging provides opportunities outside of the normal constrictions of time and proximity.

Motivation Factors

So that additional relevant predictive factors could be identified, I performed regression analysis and determined that perceived autonomy, experienced competence, and perceived relatedness accounted for approximately 42% of the variance of intrinsic motivation. These results confirm the SDT model created by Ryan and Deci (2000). My results aligned with the seminal results of Baard et al. (2004), who, in a study of over 800 corporate workers, found all three constructs predicted intrinsic motivation. Specifically related to teachers, my findings supported Sørebø et al. (2009) and Kreijns et al. (2014) who also found that experienced competence had the strongest correlation to intrinsic motivation. In other words, experienced competence was an important factor in the PD module created to encourage math teachers to participate in reflective blogging to improve instruction. In the asynchronous portions of the PD module, teachers will be guided through blogging challenges in incremental steps where they can experience successes and reach out to mentors for support along the way.

In my study, perceived autonomy represented only a slight predictive relationship to intrinsic motivation. Sørebø et al. (2009) theorized lower perceived autonomy correlation could be because the teachers felt a strong sense of autonomy and in reality took it somewhat for granted. My study was positioned in an informal vCoP where participation is completely voluntary. Consequently, the math teacher participants in my study may also have presumed autonomy in this context.

In contrast to the findings of Sørebø et al. (2009), perceived relatedness was found to be a significant predictor of intrinsic motivation. Kreijns et al. (2014) also found relatedness to be significant to intrinsic motivation. This discrepancy may be due to Sørebø et al. (2009) population being university teachers and Kreijns et al. (2014) and my study populations were both inservice teachers. In any case, it will be important in my PD module to include opportunities for SSD math teachers to make connections with other members of the math teacher blogging community.

Technology Acceptance and Motivation Factors and Participation in vCoP

In contrast to Venkatesh et al. (2003, 2012), facilitating conditions, technology anxiety, and social media use intention were not found to be significant predictive factors of social media use behavior, specifically participation in vCoP. However, when studying vCoP, Nistor et al. (2014a) and Pynoo et al. (2011) both found no significance for facilitating conditions. It is possible that the completely voluntary nature of the informal vCoP setting of my study contributed to the lack of significance of facilitating conditions and technology anxiety as predictive factors of use behavior.

The gap between technology use intention and use behavior has been identified and described by previous researchers (Harrison et al., 2014; Murillo Montes de Oca & Nistor, 2014; Nistor et al., 2014a; Pynoo & van Braak, 2014). Bagozzi (2007) cautioned researchers to consider the obstacles that may impede participants from turning intentions into actions. Potential obstacles for teacher bloggers include consistently finding the time, connecting with a community of bloggers, receiving positive feedback, and seeing direct results in their classroom (Byington, 2011).

Regression analysis also showed no significant relationship between intrinsic motivation and social media use behavior, specifically participation in vCoP. This is in contrast to the findings of Sørebø et al. (2009) who studied teachers' implementation of technology in the classroom. Additionally, Zhou (2016) found a strong relationship between intrinsic motivation and both use intention and use behavior in a voluntary Internet setting. It is important to note that my social media use behavior data was gathered by the ReaderBench automated tool; however, both of these studies used self-reported data. This difference in methodology could account for some measure of the difference in findings. Overall, in my study I was unable to identify any significant predictor constructs of social media use behavior.

Assumptions, Limitations, Scope and Delimitations

Assumptions

The assumptions for my project study were based on the belief that participants agreed to share their personal thoughts about reflective teacher blogging and completed the survey honestly and self-report accurately. I assumed that a survey design is appropriate to the problem and the purpose of the study. Additionally, I assumed that correlation data analysis is appropriate to the data collected. A final assumption is the math teacher bloggers who participate in the study had the technological skill needed to navigate to and complete an online survey.

Limitations

The limitations of this survey were based on the sampling method, participants, and data collection and analysis. First, I used a non-random snowball sampling method. Therefore, generalizations to the larger population should be made cautiously (Vogt, 2007). Next, participants were invited to complete the online survey. This is a limitation because teacher bloggers who chose to complete the survey may not be representative of the population.

Scope and Delimitations

The scope of the study was limited to the independent constructs of participants' acceptance of social media (performance expectancy, effort expectancy, social influence, facilitating conditions, computer anxiety), participants' motivation to use social media (intrinsic motivation, perceived autonomy, experienced competence, and perceived relatedness) and the dependent constructs of participants' social media use intention, their participation in vCoP (i.e., social media use behavior), and their intrinsic motivation. The scope was further limited to the participants' self-reported demographic data. The study only included English-speaking teachers who write, read, and comment on blogs focused on mathematics instruction. Further, the study was bounded by the context of informal vCoP where teacher participation is voluntary.

Ethical Considerations

The post-positivist framework of this study required ethical considerations to be a central consideration during each stage of research (Mertens, 2010). Characteristics of ethical quantitative research include scholarly trustworthiness, identification and limitation of researcher bias, thorough collection and analysis of data, and identification of the limitations of the generalizability of findings (Mertens, 2010).

Participants' rights were protected insuring confidentiality, informed consent, and protection from harm. First, data was kept confidential. The data was stored on a password-protected laptop as well as on the password-protected Google Drive site. After data analysis is completed, the data was deleted from Google Drive and will be stored for 5 years on a password-protected CD-ROM in a safe in my home office.

Participation was voluntary and the automated data analysis was restricted to public information, meaning these are blogger's posts, most likely under pseudonyms that only hackers could easily identify, in a public forum not requiring access, membership, or login information. The blogs being used for this study were not posted with the expectation of privacy. Bloggers most likely write under a pseudonym. However, if the true identify of participants was revealed, the identity was only known to the researcher and was de-identified before data analysis begins. The programmer conducting the automated analysis using the ReaderBench tool completed a confidentiality agreement.

After blogs were identified, participants were asked to read about the study, state their informed consent, and navigate by way of a URL to the online survey. Completion of the online survey was voluntary, and a participant could stop the survey at any time. There are no predictable risks or potential harm involved in completing the survey.

School mathematics teachers are adults who have completed a bachelor's degree; therefore, they are presumed to be between 20- and 60-years-old. As mathematics teacher bloggers were asked to participate, there is a chance that some volunteers could be categorized as vulnerable populations, such as pregnant women. There is no particular risk for the vulnerable population to participate in the study.

Conclusion

In this study, I investigated acceptance factors and motivation factors as potentially predictive constructs of reflective mathematics teacher bloggers' social media use intention and participation in vCoP. The results of my study showed performance expectancy, effort expectancy, and intrinsic motivation were predictive factors of social media use intention. Intrinsic motivation was further described by three components; most strongly predicted by experienced competence. No predictive factors of social media use behavior were identified. The teachers of diverse rural SSD lack congruent and consistent middle school implementation of the CCSSM in an SBLE. Local resources for PD are limited. The results of my research guided the creation of a PD module to encourage local middle school math teachers to use reflective mathematics blogging to improve instruction.

In this section, I outlined (a) the research design, (b) the research questions and hypotheses, (c) the setting and sample, (d) the measures, (e) the instrumentation, (f) data collection procedures and analyses, (g) results; (h) discussion; (i) assumptions, limitations, scope and delimitations; (j) ethical considerations for the protection of participants' rights; and (k) conclusions. In Section 3, I will use the findings of my study to describe (a) description of the blended PD module; (b) rationale; (c) project goals and target audience; (d) components, timelines, and activities. In Section 4, I will reflect on the strengths and limitations of my study and project and on my growth as a scholar-practitioner.

Section 3: The Project

Introduction

Technology advancements of the 21st century offer many learning and collaboration opportunities to students and teachers in today's schools. In one powerful example, technology can connect rural middle school mathematics teachers, such as those in SSD, with virtual colleagues across the country to deepen math content knowledge and improve instruction (Blanchard, LePrevost, Tolin, & Gutierrez, 2016; Hodges & Cady, 2013; Hunt-Barron, Tracy, Howell, & Kaminski, 2015; Luebeck, Cobbs, & Scott, 2015). As described in the *Social Media as Professional Development* subsection of the Section 1 literature review, teachers who participate in informal vCoP, such as MTBoS, analyze and change their instruction in an autonomous, self-paced environment.

The purpose of my quantitative correlation study was to investigate the predictive power of technology acceptance and motivation constructs on reflective mathematics teachers' social media use intention and participation in informal vCoP. Blogging is an effective channel for collaborating and transferring meaningful resources and experiences and acting on knowledge gained (Byington, 2011). Hanuscin et al. (2014) asserted that helping teachers understand the potential of blogging and developing new technology skills would go a long way toward achieving their PD goals.

The findings of my study showed effort expectancy, performance expectancy, and intrinsic motivation were significant predictive factors of social media use intention. My project includes three face-to-face professional development days each focused on one of these topics. Additionally, experienced competence was found to be the strongest predictor of intrinsic motivation and the yearlong asynchronous portion of the PD module is focused on providing opportunities to build these successes for teachers. The blended PD module includes an asynchronous online component focused on this topic. In conclusion, using the predictive factors identified as significant in my study: performance expectancy, effort expectancy, and intrinsic motivation, I crafted a blended PD module to increase social media use intention of SSD middle math teachers.

This section includes: (a) description of the blended PD module; (b) project goals and target audience; (c) components, timelines, learning outcomes, and activities; (d) rationale; (e) literature review that both supports the structure of the project and defines its implementation; (f) evaluation of the project including its effectiveness; (g) implications of the project's contribution to the local and vCoP stakeholders; and (h) project's potential impact on social change.

Description

Using the predictive factors identified as significant in my study—performance expectancy, effort expectancy, and intrinsic motivation—I crafted a blended PD module to increase social media use intention of SSD middle math teachers. Based on the findings of the study and considering the needs of the middle school math teachers of SSD, I designed a PD module to increase social media use intention, specifically focused on blogging, by familiarizing teachers with the receptive and generative uses of an informal vCoP, specifically MTBoS. Professional learning experiences must be designed to meet the needs of the participants and developers must consider elements that will maximize teacher learning (Hill et al., 2013). The elements, which form the conceptual framework described in more detail in the literature review below, are (a) a strong content focus, (b) modeling instructional strategies, (c) collaborative participation, (d) coherence with standards and district policies, and (e) embedded feedback (Archibald, Coggshall, Croft, & Goe, 2011; Hill et al., 2013). The purpose of this project is to encourage teachers to reach out virtually and stay connected in informal vCoP by delivering a yearlong PD module delineating the performance expectancy, effort expectancy, and experienced competence of social media use intention.

Each school year, near the close of the year, SSD performs an internal audit of classroom instruction. The results of the audit of middle school math instruction in the implementation year will be compared with previous years as one measure of the success of the PD program. Additionally, a summative survey of participating teachers will be conducted to further understand the teachers' social media use intention and changes in instruction as a result of the PD module.

Project Goal and Target Audience

The goal of this PD module is for the participant teachers to increase their social media use intention. The results of the study revealed performance expectancy, effort expectancy, and intrinsic motivation, specifically experienced competence, were predictive factors of social media use intention. Strand 4e of Danielson's (2013) framework for teaching, which is used in SSD for teacher evaluation, allows great flexibility for professional learning; participation in the PD module of my project study fully meets the requirements. The activities of the PD module build from receptive use of the informal vCoP—reading and commenting on blogs—to generative use—writing a blog—all while building confidence and focused on the CCSS content of teachers' own math classrooms.

The specific target audience is the middle school math teachers of SSD. Since the study participants were members of MTBoS English-speaking countries, the results of the study and the PD module will be posted on my reflective math teaching blog and will be available to all the members of the MTBoS community. Therefore, the PD module could be implemented by any member of MTBoS at his or her own school district to encourage teachers to improve their instruction by participating in blogging.

Rationale

A lack of congruent and consistent implementation of the Common Core State Standards in mathematics (CCSSM) in a standards-based learning environment is a problem facing a rural, socioeconomically disadvantaged Southwestern school district as identified through an internal district audit. In the current climate of declining revenues, "professional development is among the major targets for budget cuts" (Akiba, Wang, & Liang, 2015, p. 275). Innovative and cost-saving avenues for PD, such as reflective blogging, must be explored for fostering teacher learning to reconcile the enacted and intended curriculum. Research shows that teachers who collaborate in an informal vCoP deepen both their content knowledge and improve their pedagogical skills (Blitz, 2013). The virtual environment has been found to consistently be superior in promoting self-reflection on instructional practices (Blitz, 2013; Fishman et al., 2013). However, teachers are unlikely to take the initiative to begin reflective blogging on their own.

Ciampa and Gallagher (2015) found that teacher participation in blogging was limited by low technology acceptance.

The findings from my correlation study showed performance expectancy, effort expectancy, and intrinsic motivation—specifically experienced competence—are predictive factors of math teachers' social media use intention. Learning outcomes of effective PD meet the requirements for professional learning of the adopted teacher evaluation system, focus on the adopted content standards, and build coherence among all the activities (Learning Forward, 2011). By focusing the content of the PD modules on the mathematics taught in the classrooms of SSD, making connections among the activities, and showing the teachers how to log the work to receive credit within the teacher evaluation system, the PD module meets the goals. The PD module meets the USDOE Office of Educational Technology (2016) recommendation to create PD for teachers incorporating technology that will "increase their digital literacy and enable them to create compelling learning activities that improve learning and teaching, assessment, and instructional practices" (p. 37).

Review of the Literature

Conducting the second literature review of my project study was an iterative process similar to the literature review establishing my theoretical framework and research questions. I re-read a modest number of seminal peer-reviewed journal articles from Section 1: The Problem and gained new insights on PD. Educational researchers have conducted numerous studies on PD and the database searches were straightforward. I searched the Walden University library's Thoreau Multi-Database Search, Teacher

Reference Center, Education Research Complete, and ERIC databases. I also extensively searched Google Scholar, where I gathered my articles into a library. To ensure I was including the most current research, I searched upcoming journals at the American Educational Research Association, National Council of Teachers of Mathematics, Learning Forward, and the Association for Middle Level Education websites. Search keywords and phrases were *professional development* individually and paired in combinations with the terms *math**, *face-to-face, virtual, online, blended, middle school, rural,* and *high-poverty.* Additional resources were identified through the references of articles and US Department of Educational Technology research reports. Sources were limited to peer-reviewed journal articles published within the last three years and a few seminal articles.

Effective Professional Development

Half of all teachers identify a shortage of PD as the greatest obstacle to using technology more effectively (USDOE, 2016). Teachers in Ciampa and Gallagher's (2015) study pinpointed a lack of training on how to use the blogs as one of the biggest obstacles to their implementation. Guskey (2002) defined professional development programs as "systematic efforts to bring about change in the classroom practices of teachers, in their attitudes and beliefs, and in the learning outcomes of students" (p. 381). Providing effective PD will be critical for SSD middle school math teachers to be able to implement blogging to improve their instruction.

Education researchers have come to a general consensus through numerous studies conducted over the last twenty-five years that the elements of effective PD include: (a) robust attention to content, (b) active engagement of teachers modeling student-centered instructional strategies, (c) frequent integration of opportunities for collaboration, and (d) thoughtful alignment with school or district curricula (Akiba et al., 2015; Hill et al., 2013; Marrongelle et al., 2013; Sample McMeeking, Orsi, & Cobb, 2012). The researchers additionally noted that high-quality PD must have teacher buy-in underlying each element (Archibald et al., 2011; Capraro et al., 2016). Class and Schneider (2014) posited that to be motivated by PD, adult learners need to see connections between application to their professional environment and the PD. Teachers choose to voluntarily participate in PD if learning outcomes appear clear, specific, meaningful, and challenging (Gorozidis & Papaioannou, 2014).

Feedback and follow-up occurring within a sustained program was identified by Archibald et al. (2011) as a fifth element of effective PD. Professional development delivered during a 2-week summer-only workshop focused on math content without instructional practices did not have significant impact on teacher knowledge or student achievement (Garet et al., 2011). Sustained PD changed teachers' classroom behaviors in ways that showed a positive and significant effect on student learning and student achievement gains (Blanchard et al., 2016; Barrett, Cowen, Toma, & Troske, 2015; Capraro et al., 2016; Darling-Hammond et al., 2009; Gersten, Taylor, Keys, Rolfhus, & Newman-Gonchar, 2014). An innovation that has sustainability "can be integrated into ongoing operations to benefit diverse stakeholders" (Johnson, Hays, Center, & Daley, 2004, p. 146). Sustained PD extends 6 to 12 months with feedback and follow-up (Darling-Hammond et al., 2009; Herbel-Eisenmann, Steele, & Cirillo, 2013).

Although researchers have agreed upon characteristics of effective PD, there is no agreement on which PD approach is the most effective. Even Gersten et al.'s (2014) meta-analysis of 643 studies of math PD does not reveal a superiorly effective approach. In the next subsections, I review face-to-face PD, digital PD, and blended PD, which combine digital and face-to-face modalities. I also examine research about PD for mathematics teachers in general and middle school math teachers specifically.

Face-to-face Professional Development

A school district's PD workshop day provides the opportunity for teachers who work together daily to have the benefit of learning with those same colleagues. Teachers advance their practice when they have time to collaborate with their peers (Capraro et al., 2016). Teachers need time for both collaboration and individual reflection (Archibald et al., 2011; Lauer, Christopher, Firpo-Tripplet, & Buchting, 2014). Face-to-face PD needs to incorporate time for learning as well as time for collaboration and time for reflection.

Effective face-to-face PD uses demonstrations, field experiences, and sharing of student work to focus the learning on teachers' own classrooms. Demonstrations in effective face-to-face PD show the skills teachers will be learning (Lauer et al., 2014). The PD instructor should carefully choose a demonstration teachers will find relevant to their classroom content (Lauer et al., 2014). An opportunity for teachers to practice should be included in the workshop day, if possible (Boston, 2013). Scheduling face-to-face PD sessions to allow for field experiences between sessions allows teachers to apply skills to their own classrooms and return with experiences to share with fellow participants at the next session (Barrett et al., 2015; Boston, 2013; Curwood, 2013; Lauer et al., 2014). Sharing deidentified student work as part of PD makes classroom practice public, gives teachers an opportunity to share and receive positive feedback from peers, and focuses on the subject area content from the teachers' own classrooms (Curwood, 2013).

Digital Professional Development

Advances in technology allow PD to be delivered in many new ways (Hill et al., 2013; Tseng & Kuo, 2014; USDOE, 2016). Digital PD has the advantage of the reduced costs of providing PD in a virtual setting. (Luebeck et al., 2015; McConnell, Parker, Eberhardt, Koehler, & Lundeberg, 2013). Another advantage is that digital PD can accommodate teachers' busy schedules and provide just-in-time support (Bates, Phalen, & Moran, 2016; Blitz, 2013; Fishman et al., 2013; USDOE, 2016). Teachers can access powerful resources not available locally, such as STEM professionals using digital PD (Fishman et al., 2013; USDOE, 2016). Digital PD can connect teachers across town or even overcome isolation and connect teachers across vast geographic distances (Blitz, 2013; Fishman et al., 2013; Twining, Raffaghelli, Albion, & Knezek, 2013; McConnell et al., 2013).

With the persuasive benefits of digital PD, PD developers must know if digital PD can be as effective as traditional face-to-face PD. Studies have shown both face-to-face and digital PD can be effective (Bates et al., 2016; Fishman et al., 2013; Hill et al., 2013; McConnell et al., 2013). Similar to traditional PD, effective digital PD needs to incorporate focus on content, active-learning pedagogy, time for individual reflection, and collaboration among teachers (Blitz, 2013; Fishman et al., 2013; Twining et al., 2013). In addition, digital PD must address the technology skills and competencies necessary for teachers to be successful (Albion, Tondeur, Forkosh-Baruch, & Peeraer, 2015; Twining et al., 2013). When considering digital PD, instructors should use the same technology tools teachers will use in their classrooms so they become more familiar with them (Albion, et al., 2015; Ertmer et al., 2012).

There are many types of digital PD including videoconferencing, online courses through universities, MOOCs, and social media. Through social media, teachers can join an informal vCoP, such as MTBoS, and author, comment, and read blogs. Through participation in vCoP, teachers improve their instruction and build content knowledge (Hur et al., 2012; Matzat, 2013; McConnell et al., 2013; Tseng & Kuo, 2014). Ertmer et al. (2012) and Tseng and Kuo (2014) found that teacher participation in vCoP enabled the development of new instructional strategies to implement in the classroom and recommended the creation of PD opportunities to familiarize teachers with reflective teacher blogging.

Blended Professional Development

Combining face-to-face sessions with digital PD experiences allows blended PD to be compatible with teachers' time and availability (Albion et al., 2015; Blanchard et al., 2016; Marrongelle et al., 2013; McConnell et al., 2013). Networked learning balances face-to-face interactions with online asynchronous tasks (Bates et al., 2016; Class & Schneider, 2014; Hanraets, Hulsebosch, & de Laat, 2011). One of the benefits of blended PD is significantly reducing the costs of PD while maintaining and even enhancing the engagement and effectiveness (Hilliard, 2015). Bates et al. (2016) posit based on findings in their study, “school-based collaboration is still necessary, maybe even more necessary, in an environment where teachers are participating in independent online learning activities” (p. 73). Blending face-to-face experiences for even some of the members benefits the interactions of everyone (Matzat, 2013). Blended PD reduces free-riding and trust issues and fosters sharing and more intense discussion in the vCoP (Matzat, 2013). Gorozidis and Papaioannou (2014) found teachers who engaged in collaborative networks throughout their PD and implementation of innovations functioned more successfully. Blending online and face-to-face PD can provide rural middle school math teachers with opportunities to improve instruction that would otherwise not be available to them (Hodges, & Cady, 2013). Teachers reported that face-to-face workshops helped them navigate the online environment and develop a shared sense of community (Hodges, & Cady, 2013).

Teachers reported obstacles to blogging including finding the time to blog (Hunt-Barron et al., 2015). It will be important in my PD module to address teachers’ concerns and provide an opportunity to brainstorm solutions to obstacles. Le Fevre (2014) and Hunt-Barron et al. (2015) found teachers were reluctant to share their classroom practice publicly. Duran, Brunvand, Ellsworth, and Şendağ’s, (2011) yearlong technology integration PD study was also set in a rural Southwestern school district. The researchers found the participants have widely differing gaps of technology knowledge (Duran et al., 2011). One-third of the teachers felt that the PD did not prepare them sufficiently to use the technology (Duran et al., 2011). The researchers proposed a solution of “incorporating a mentoring component in the PD structure” (Duran et al., 2011, p. 328). I have incorporated into my PD module a mentoring component to allow teachers to voluntarily request a mentor to help them with technology issues in using social media to improve their instruction.

Mathematics Professional Development

In a statewide longitudinal study, Harris and Sass (2011) found that PD had a greater impact on student achievement for middle school math teachers than for teachers of any other grade level K through12 or any other subject. Middle school math teachers positively rate the professional knowledge of their peers, but feel they do not have time to reflect on PD or collaborate with their peers in order to put PD learning into practice (Akiba et al., 2015). Middle school math teachers can participate in CoP, also known as PLCs, both virtual and face-to-face to revisit experiences over an extended period of time (Hodges, & Cady, 2013; McConnell et al., 2013).

Mathematics education experts from across the United States collaborated with representatives from the five national professional organizations whose missions address math teachers' PD met and created recommendations for effective PD for mathematics teachers of CCSSM. The resulting joint effort agreed effective PD:

1. Includes opportunities to engage with CCSSM math content and practice standards in a focused and integrated way;
2. Uses materials and instruction aligned with CCSSM;
3. Takes into account existing knowledge about effective ways to organize learning experiences for teachers of mathematics;

4. Provides experiences in which practicing math teachers engage over an extended period of time; and
5. Uses expert facilitation to ensure teacher learning (Marrongelle et al., 2013).

The first two recommendations target the alignment of PD with the CCSSM. The PD should be strongly focused on appropriate math content and practice standards (Barrett et al., 2015; Conference Board of the Mathematical Sciences, 2012; Harris & Sass, 2011). In my PD module, I have carefully chosen CCSSM content and practices standards from the major clusters in middle school for the demonstrations and practice lessons during the workshops (NGA Center & CCSSO, 2010). The PD instructor must introduce technology tools for teacher use as well as student learning (Blanchard et al., 2016; Conference Board of the Mathematical Sciences, 2012; USDOE, 2016). Each teacher will choose a CCSSM content and a practice standard to prepare to teach as the focus for a series of field experiences using social media and exploring the informal vCoP, MTBoS.

The third recommendation centers on organizing the learning experiences, taking existing knowledge about best practices in math education into account. Attention to mathematical discourse and the use of cognitively challenging mathematical tasks are both important learning experiences for effective PD for mathematics teachers (Boston, 2013; Herbel-Eisenmann et al., 2013; Hughes, Brendefur, & Carney, 2015; Michaels & O'Connor, 2013; Marrongelle et al., 2013; Stevens, Aguirre-Monoz, Harris, Higgins, & Liu, 2013) To meet the high standards of CCSS, middle school math teachers must allow students to productively struggle with challenging mathematical tasks, explain their reasoning, and make connections among mathematical ideas (Jackson et al., 2013). Math PD should support teachers developing productive and powerful classroom discourse as a research-based effective instructional strategy (Herbel-Eisenmann et al., 2013; Michaels, & O'Connor, 2013).

When given the opportunity to reflect on how the rigorous tasks contributed to their own learning, teachers appreciated the power of cognitively challenging tasks for their students to reason and make sense of mathematics (Boston, 2013). Teachers who participated with challenging mathematical tasks as learners during PD successfully improved instructional practices including implementing rigorous tasks (Boston, 2013; Hughes et al., 2015; Sample McMeeking et al., 2012; Stevens et al., 2013). Participating in rigorous mathematical tasks as learners and looking together at student work of such tasks helps teachers learn to uncover students' misconceptions (Hughes et al., 2015).

The fourth recommendation focuses on math teachers engaging with PD over an extended period of time. Barrett et al. (2015), Luebeck et al. (2015), and Blanchard et al. (2016) found that sustained PD for rural middle school math teachers had a positive impact on student achievement even a year later. Sample McMeeking et al. (2012) found that deepening middle school math teachers' content knowledge and broadening their inquiry-based instructional strategies translated into improved student proficiency in mathematics. Math teachers' self-efficacy grew and was retained at a post PD level for six years following a sustained PD designed to increase their knowledge related to technology (Stevens et al., 2013). Sustained PD for math teachers has less pressure than a graded PD such as a university course for credit, allows for sharing experiences and gaining positive feedback from virtual and face-to-face peers, and builds mastery upon implementation of the new strategies (Stevens et al., 2013).

The fifth and final recommendation highlights the use of expert facilitation to ensure teacher learning. Math teachers need collaboration with peers to improve instruction (Hall, 2010; Herbel-Eisenmann et al., 2013). I have been leading weeklong PD sessions for middle school math teachers across the country for a nationally recognized company for more than 10 years and am qualified to lead my PD module. Prestidge (2014) found math teachers' lack of understanding of reflective writing inhibited their blogging. On the third day of the workshop, before teachers write their first blog post, an exercise on reflective writing will be incorporated into the SSD's middle school math teachers PD. I will enlist the assistance of the district's language arts instructional coach to ensure the math teachers are comfortable with reflective writing concepts and available resources before they begin blogging.

Conceptual Framework of Blended PD for Mathematics Teachers

The elements of an effective PD program can be incorporated to create a blended PD module for middle school mathematics teachers with the potential to increase their sense of community, social media use intention, and professional learning. Lee's (2014) model served as the conceptual framework for creating my blended PD module where teachers participate in both face-to-face and vCoP. The five-stage model outlines roles for participants and instructors at each stage: (1) Motivation and Socialization, (2) Information Exchange, (3) Knowledge Construction, (4) Development, (5) Contextualized Practice (Lee, 2014).

The first stage, motivation and socialization, is approached in both the face-to-face and vCoP (Lee, 2014). Participants are familiarized with the technology and begin to establish collaborative connections with virtual and face-to-face peers as well as the PD instructor (Lee, 2014). Sense of community (SoC) builds and sustains relationships among colleagues in a CoP (Nistor, Daxecker, Stanciu, & Diekamp, 2105a). Nistor et al.'s (2015) study "emphasizes the importance of SoC and interpersonal knowledge in academic communities as major factors of community building and knowledge sharing motivation" (p. 258). Therefore, this stage will be critical to strengthen the relationships among the members of the SSD middle school math PLC and to establish relationships with members of the informal vCoP MTBoS.

The participants become familiar with the PD module goals, timeline, and learning outcomes during the second stage, information exchange (Lee, 2014). The guiding documents for the PD are shared with the participants so that they have a clear picture of the scope and sequence of the modules. At this stage, it is important for the instructor to listen to the needs of the participants and tailor the PD module to meet those needs (Lee, 2014). Through the information exchange stage, the instructor creates a space for essential teacher buy-in to form.

Teachers will collaborate with virtual and face-to-face peers during the knowledge, construction, and development stages to deepen mathematical conceptual knowledge, improve instructional strategies, and build confidence working within the online community (Lee, 2014). Teachers, provided with PD time to collaborate, improve their practice and have the potential to improve student achievement (Luebeck et al., 2015). During these stages, teachers will be engaged in attention to mathematical discourse and the use of cognitively challenging mathematical tasks (Boston, 2013; Herbel-Eisenmann et al., 2013; Michaels, & O'Connor, 2013; Stevens et al., 2013). In the final stage of the model, contextualized practice, the PD module provides opportunities for the participants to implement the strategies in their own classrooms and return to the group to reflect on the implementation (Lee, 2014). The stages of the model are cyclic and participants and instructors return to stages throughout the sustained PD module leading to experienced competence, deep learning and enhanced practice (Lee, 2014).

Implementation

Based on the findings of my study and review of current literature, the resultant project is a blended PD module whose audience is SSD middle school mathematics teachers. In this subsection, I describe the resources, supports, and the timetable required for effective implementation of the project. I also discuss potential barriers and the roles and responsibilities of the student and others.

Potential Resources and Existing Supports

Potential resources for the effective implementation of the blended PD module are a classroom with Wi-Fi connection, a SMART board projector, document camera, and a laptop cart. These resources exist in the classroom where the teachers meet for their PLC. Some teacher participants will prefer to bring their own laptops to the workshop. Each teacher in the district can log into the district Wi-Fi with his or her staff login information. Other resources include access to photocopy service for duplicating handouts and evaluation forms for the workshop days of the blended PD module. The district provides photocopy services for PD opportunities provided to its teachers. The SSD leadership team strongly supports PD for middle school math teachers to collaborate and improve instruction. Moreover, they have supported me throughout my study and development of my project and are looking forward to the benefits of implementation.

Potential Barriers

All schools in New Mexico receive School Grades from the Public Education Department of A through F. These grades are based primarily on standardized test results in mathematics and language arts taken by grades 3 – 10 students. Therefore, there is great pressure on middle school mathematics teachers to improve students' achievement on the PARCC test. A potential barrier is the multitude of things that could be scheduled during the available professional development time available to middle school mathematics teachers. It is important to show all the stakeholders the potential benefits by describing the study findings, the literature review framework, and the learning outcomes of the planned blended PD module.

An additional potential barrier may be failure of completion of the asynchronous portions of the PD due to lack of time or frustration with the technology. Teachers have many demands on their time and could find it difficult to find the time to complete the field experiences between sessions. I will offer friendly reminders during the interim months. Some teachers may struggle with the technology of the informal vCoP and blogging. A teacher may choose to sign up for a mentor through the MTBoS website. We will also have biweekly afternoon sessions where teachers can come together to work or ask questions.

Proposal for Implementation and Timetable

The PD module (see Appendix A) consists of two major components. The first component is three one-day workshops provided during the inservice days throughout the school year. The second component consists of asynchronous virtual challenges following each one-day workshop for teachers to practice the skills acquired during the workshop and make connections to virtual colleagues within the MTBoS community. A voluntary extension component consists of participation in the ongoing MTBoS mentor/mentee program where teachers can work throughout the school year with an active member of the MTBoS community who has volunteered to serve as a mentor. The timeline for this PD module is designed for one academic school year.

The module begins with a one-day workshop delivered to the staff during the inservice days before the start of school. The focus of this workshop is the technology acceptance predictive factor of performance expectancy. Therefore, the workshop will introduce teachers to the structure, MTBoS and show teachers how they can use the informal vCoP to locate resources and connect with virtual colleagues who are teaching the same CCSS standards using effective instructional strategies in their classrooms with similar populations. Teachers will be given two asynchronous digital challenges to try before the next one-day workshop. These challenges focus on trying out the content of the day within their own classrooms and making connections with virtual colleagues within the MTBoS. This introductory workshop and the follow-up virtual challenges will focus on the receptive uses of the informal vCoP, introducing teachers to reading and commenting on the blogs of reflective math teacher bloggers. The Learning Outcome for Day One is: *Performance Expectancy* - Teachers will be able to demonstrate reading and commenting on math blogs of the MTBoS community to find instructional strategies and activities for CCSS math content they are currently teaching.

The second one-day workshop will be held on an October inservice day. The focus of this workshop is the technology acceptance predictive factor of effort expectancy. Therefore, the workshop will introduce teachers to the MTBoS search engine and Twitter feed and show teachers how they can use the informal vCoP to make finding resources and instructional strategies appropriate for their classroom fast and easy. Teachers will be given two more asynchronous digital challenges to try before the next one-day workshop focusing on trying out the content of the day within their own classrooms and deepening a connection with a virtual colleague within the MTBoS. This second workshop and the follow-up virtual challenges will again focus on the receptive uses and introduce generative uses of the informal vCoP, encouraging teachers to read and comment on one blog that closely matches their own classroom as well as establishing and using a Twitter account to follow developments within the MTBoS community. The Learning Outcome for Day Two is: *Effort Expectancy* – Teachers will be able to demonstrate using the MTBoS search engine and Twitter to quickly find content and connect with virtual colleagues.

The third one-day workshop will be held on a January inservice day prior to the start of the second semester. The focus of this workshop is the intrinsic motivation predictive factor of experienced competence. Therefore, the workshop will be a short training on reflective writing followed by a work session where teachers create blogs of their own in the Wordpress format and write their first blog posts describing themselves and their classrooms for the About pages in their blogs. Teachers will be given two final asynchronous digital challenges to try. The first challenge is writing a blog post linking to an activity they tried from another MTBoS member's blog and describing how they adapted the lesson to work in their own classroom. The second challenge is describing a day in their teaching life soliciting resources or advice from the MTBoS community and tweeting a link to the post to @MTBoS. This third workshop and the follow-up virtual challenges will again focus on the receptive uses and introduce generative uses of the informal vCoP, encouraging teachers to read and comment on one blog that closely matches their own classroom as well as establishing and using a Twitter account to follow developments within the MTBoS community. As an optional extension to the PD module, teachers will be shown the website https://exploremtbos.wordpress.com/ at the first one-day workshop where they can complete a questionnaire and be matched with a virtual colleague mentor who can guide them throughout the process of getting to know the informal vCoP. The Learning Outcome for Day Three and Asynchronous Challenges is: *Experienced Competence* – Teachers will be able to demonstrate success with creating and using their own blog and Twitter feed to connect with the MTBoS community and improve their instruction.

Roles and Responsibilities

My role is that of PD module developer and workshop instructor. My responsibilities are to lead the face-to-face sessions and guide teachers in developing skills needed to become members of the informal vCoP, MTBoS and establish their own blogs to improve their instruction. SSD middle school math teachers' role will be to attend the face-to-face workshops and to complete the asynchronous assignments between sessions. If teachers choose to sign up to be paired with a MTBoS mentor, these volunteer mentors' roles will be the same as with any other mentee who signs up through the website. The role of the district middle school math instructional coach will be to schedule the PD sessions, assist with technology during the workshops, and act as the liaison with the district leadership team. The middle school language arts instructional coach will provide the reflective writing lesson on day 3 of the workshop.

Project Evaluation

The blended PD module consists of three one-day workshops spaced throughout the school year and asynchronous field experiences between each workshop. Therefore, the evaluation plan for the project is twofold. One component will be an outcomes-based formative assessment piece following each one-day workshop. The second component will be a goal-based summative assessment. The evaluation of the blended PD module must be set in the context of the classroom, in this case, the CCSSM content and practice standards for middle school math (Archibald et al., 2011).

Formative Assessment

The formative assessment for each day will be framed by the learning outcomes for the day. The Learning Outcome for Day One is: *Performance Expectancy* - Teachers will be able to demonstrate reading and commenting on math blogs of the MTBoS community to find instructional strategies and activities for CCSS math content they are currently teaching. The Learning Outcome for Day Two is: *Effort Expectancy* – Teachers will be able to demonstrate using the MTBoS search engine and Twitter to quickly find content and connect with virtual colleagues. The Learning Outcome for Day Three and Asynchronous Challenges is: *Experienced Competence* – Teachers will be able to demonstrate success with creating and using their own blog and Twitter feed to connect with the MTBoS community and improve their instruction. At the end of each day's workshop, teacher input will be collected on the district's PD evaluation form (See Appendix A page 143). Teacher responses on the form will guide modifications to the remaining portions of the module (Lee, 2014).

Summative Assessment

At the conclusion of the blended PD module, summative assessments will be used to evaluate the effectiveness. The goal of this PD module is for the participant teachers to increase their social media use intention. To evaluate a change in social media use intention teacher participants will take the 5-question social media use intention subscale portion of the survey at the beginning and again at the conclusion of the PD. This will be easily accomplished using a Google Form with the data gathered in a Google Sheet. Additionally, I will create a digital collection of the teachers' blogs and the resources they have found useful in the vCoP so that the teachers may have access to those resources in the future.

Implications Including Social Change

Local Community

This study and resulting project will contribute to positive social change for rural mathematics teachers by creating an environment to encourage personal reflection and collaboration with virtual colleagues and ultimately improve mathematical instructional practices. The mathematics teachers could also share these improved instructional practices with mathematics teachers at other levels as well as teachers in other disciplines thereby improving school experiences for students throughout SSD. Mathematics teachers who participate in personal reflection, collaborate with likeminded teachers, and engage in effective continuing PD, increase their confidence and self-efficacy to teach all their students (Main & Pendergast, 2015).

Far-Reaching

In the larger context, the study and resulting project could also contribute to positive social change for the informal mathematics teacher blogging community at large. A summary of the study results as well as the blended PD module will be posted on my blog. Other members of the vCoP could adapt the module to use in their own district or region to increase social media use intention with other math teachers. Also participation from SSD middle school math teachers can contribute meaningfully to the discussion and build the community creating positive social change in the vCoP at large.

Conclusion

I used a self-report survey and automated data analysis of blog postings to determine potential predictive factors of mathematics teachers' participation in informal vCoP to improve instruction. The goal of the project was for SSD middle school math teachers to increase their social media use intention. Multiple linear regression analysis revealed performance expectancy, effort expectancy, and intrinsic motivation as predictive factors of social media use intention. I created a PD module consisting of three one-day workshops and asynchronous online follow-up activities to provide opportunities focused on these constructs. By participating in the training, SSD math teachers will build a SoC, as described by Nistor et al. (2015), with their virtual colleagues in the informal vCoP, while simultaneously strengthening relationships with their SSD colleagues. As described in the literature review, changes such as these have been shown to result in improved classroom instruction.

In Section 1, I described the problem, reviewed the literature, and created research questions and hypotheses. In Section 2, I described the correlation study design, analyzed multiple linear regression data, reported the results, and described the ethical considerations. In Section 3, I used the findings of my study to report (a) description of the blended PD module; (b) rationale; (c) project goals and target audience; (d) components, timelines, and activities. In Section 4, I will reflect on the strengths and limitations of my study and project and provide a retrospective analysis of my growth as a scholar-practitioner.

Section 4: Reflections and Conclusions

Introduction

The purpose of the correlation study was to identify and describe predictive factors of reflective mathematics teachers' social media use intention, particularly blogging, to improve instruction. The study involved blog authors, readers, and comment writers from English-speaking, mathematics teachers' blogs available on public vCoP, particularly members of the informal community known as MTBoS. A PD module was created that focused on the constructs found to predict social media use intention. The blended PD module consisted of three face-to-face workshop days paired with asynchronous activities throughout the school year to provide opportunities for SSD middle school math teachers to experience the informal vCoP and strengthen the SoC within their own PLC with the goal of improving instruction.

In this section, I discuss the strengths and limitations of the project and provide recommendations for alternate approaches. This section includes discussions of the knowledge I gained on my doctoral journey about scholarship, project development, leadership, and change. Additionally, the section includes a reflection on the importance of the work and what I learned. Finally, I conclude this section with a reflection on the project study's potential for positive social change and its implications, applications, and directions for future research.

Project Strengths and Limitations

The strengths of the PD module I developed as my project lie in grounding the content in the research study outcomes and using the blended model of delivery. The findings of my study showed effort expectancy, performance expectancy, and intrinsic motivation were significant predictive factors of social media use intention. My project includes three face-to-face PD workshops, each focused on one of these topics. Additionally, experienced competence was found to be the strongest predictor of intrinsic motivation and is the focus of the yearlong asynchronous portion of the PD module.

Combining face-to-face sessions with digital PD experiences allows blended PD to be compatible with teachers' time and availability. Teachers who engaged in collaborative networks throughout their PD and implementation of innovations function more successfully than teachers who only participate in workshops (Gorozidis & Papaioannou, 2014). Blending online and face-to-face PD can provide rural middle school math teachers with opportunities to improve instruction that would otherwise not be available to them.

The limitations of my study were based on the sampling method, participants, and data collection and analysis. First, I used a nonrandom snowball sampling method. Therefore, generalizations to a larger population should be made cautiously. Next, participants were invited to complete the online survey. This is a limitation because teacher bloggers who chose to complete the survey may not be representative of the population. Teachers have many responsibilities and chose to participate in the informal vCoP known as MTBoS voluntarily. Finally, the scope was limited to the teachers' self-reported data on the survey and the automated data collected from the participants' blog entries.

The commitment of stakeholders, teacher buy-in, and varying technological knowledge of teachers are the basis of the limitations of my project. Staff development time is very limited in today's academic calendars. District administrators must decide which program or content is the best use of time for their teachers. For this reason, it will be critical to provide these stakeholders with the background information and data to make an informed decision of the benefits of the proposed PD module to address the local problem.

Secondly, for PD to be effective there must be teacher buy-in. Adult learners need to see connections between application to their professional environment and the PD to be motivated and engaged in PD (Class & Schneider, 2014). Teachers choose to voluntarily participate in PD if learning outcomes appear clear, specific, meaningful, and challenging (Gorozidis & Papaioannou, 2014). Teacher-buy in will be nurtured through careful planning and delivering of the information exchange stage of the PD.

Finally, teachers have vastly different levels of technology knowledge. The content and delivery of my PD module includes technology. Therefore, my PD must address the technology skills and competencies necessary for teachers to be successful. For this PD module, the instructor will use the same technology tools that the teachers use in their classrooms. Finally, I have incorporated into my PD module a mentoring component to allow teachers to voluntarily request a mentor to help them with technology issues in using social media to improve their instruction.

Recommendations for Alternate Approaches

The teachers of a diverse, rural district in the Southwest United States are grappling with implementation of the Common Core standards. Teachers inconsistently use curriculum, instructional practices, and common assessments. The school district annually faces increasingly severe budget cuts due to a steady drop in student enrollment and rising costs. The area's remote location and these continuing fiscal shortfalls limit opportunities despite the school district's best efforts to provide quality PD for mathematics teachers.

As an alternative to the proposed blended model PD module, a face-to-face model without an online component or an online module would be possible. Teachers could enroll in an online course such as Jo Boaler's *How to Teach Math* MOOC offered by Stanford University. However, such a course may be cost prohibitive for the district. A new approach being implemented by the district, in partnership with the local university, is quarterly lesson study days. Teachers at the same grade level gather to prepare, teach, and debrief a lesson. Local CoP may be a complement to the blended PD, module where teachers can implement the lesson study cycle on a lesson they want to try from the informal vCoP to improve instruction.

Scholarship

Throughout my doctoral journey, my understanding of scholarship has continued to deepen and expand. Scholarship is a quality that brings specialized knowledge to academic work in three ways: scholarship of academic study, scholarship of teaching and learning, and scholarship of academic practice (Brew, 2010). Scholarship of academic study in the 21st century no longer requires students to memorize vast amounts of information, but instead we must learn skills to analyze the vast amounts of data available instantly through technology (Hilliard, 2015). Through my coursework and project study I honed these skills of critical analysis. I learned to find and critically read scholarly articles, develop themes, make rational judgments based on evidence, continuously reflect, and make adjustments to my work.

The scholarship of teaching and learning requires specialized knowledge of content and pedagogy (Brew, 2010). Throughout my 30-year teaching career, I have always believed that teachers are lifelong learners, but it has never been truer than my experience of the last 5 years on this doctoral journey. With each new concept or idea learned in the post-graduate classroom and doctoral reading, I have asked myself to consider the impact and potential transformation to my teaching. As Brew (2010) posited, reflection “is the critical element in the development of teaching as a scholarly activity” (p. 109). Scholarship of teaching and learning can have a more pronounced impact when it is collaborative (Marquis, Healey, & Vine, 2016). This became very true for me as I collaborated with my middle school math PLC and more so as I collaborated with virtual colleagues of the informal vCoP known as MTBoS. For example, after learning about PLCs in my coursework, the other sixth grade math teachers and I began our own PLC and have grown and enhanced our teaching through the years. From MTBoS, I learned about using Interactive Math Notebooks; now it is a critical part of my math instruction, helping my students summarize and record the big ideas of math they are learning.

The scholarship of academic practice requires the problems faced in academic settings to be developed into hypotheses for investigation (Brew, 2010). This is the process undertaken here in my project study with the guidance of my committee. I defined a local problem and looked for evidence of the problem at the local level and in professional literature. Through a thorough literature review, I chose an appropriate theoretical framework and developed research questions and hypotheses. I conducted a quantitative study and analyzed the data using multiple linear regression analysis. Finally, I created a project focused on the study results to address the local problem. With the successful completion of this project study, I will take this newfound skillset forward into my professional work environment.

Project Development and Evaluation

This doctoral journey afforded me the opportunity to develop and evaluate a project study to address a local problem. The process began with writing a proposal to outline a local problem and provide evidence of the problem both at the local level and in the professional literature. I was determined not to write a study where the evidence of the problem or the data for my research was historically archived student achievement data. Using critical reasoning skills and working with the local stakeholders, I was able to acquire the evidence required to support the local problem. The proposal also included an extensive literature review, the selection of the appropriate theoretical frameworks to support my study, and the development of my research questions and hypotheses. When I began my research, I knew very little about technology acceptance or motivation theories and I was very grateful for the patient, clear guidance of my chair. My initial drafts did not provide sufficient links between the problem and proposed research. Effective intervention from my committee and attendance at a Walden Capstone Writing Intensive provided clarity and allowed me to complete the proposal phase successfully.

The Walden Research Center staff was very helpful as I completed the IRB application. I completed the required elements and documents and received approval to begin collecting data in sufficient time for Math Twitter Camp in the summer of 2015. It was more difficult than I had anticipated collecting survey responses from 100 participants, due to a 25% response rate. By the end of 2015, I had reached my target sample size. I learned that research often requires patience and perseverance.

Analyzing the data was the most rewarding part of the project study for me, as I was able to use my mathematical background in statistics. It was very rewarding to upload the data into the SPSS software and use statistical tests and create tables and graphs of real data that I had collected—data that had meaning. When my chair and I agreed the data should be grouped in a different way, I happily ran the statistics again. I found that quantitative research is something I enjoy and will pursue professionally going forward. In my position as teacher/leader, I can play an expanded role offering my knowledge of quantitative research to help my school and my district to make sense of the massive amounts of available data.

I analyzed the data and created a project focused on the findings of the study. The project was a blended model PD module incorporating both face-to-face workshops and online asynchronous activities. I decided to create a blended model for my PD module because of the findings of my second literature review. The blended model provides the benefits of the face-to-face workshops for teachers to work with their local colleagues as well as opportunities get to know their online MTBoS colleagues. Additionally, between sessions, teachers can apply what they are learning to their classrooms and explore the informal vCoP. Evaluation of the delivery of the PD workshops themselves was constrained to the evaluation tools used by the district in which the PD module was being delivered. Evaluation of the effectiveness of the PD module to meet the goal of increasing the social media use intention was done by using the same short survey instrument used in the study. I learned that evaluation of a project must consider all stakeholders and the type of evaluation data needed. The overall learning experience of the project development and evaluation deepened my understanding of the rigor required of such an endeavor.

Leadership and Change

When I was named 2011 New Mexico Teacher of the Year and received the scholarship from Walden University to pursue an advanced degree, I began perusing the catalog. As soon as I found the Doctor of Education in Teacher Leadership, I knew I had found exactly the program for me. Educational change happens only when educators find personal meaning in what they are learning (Fullan, 2016). Our district adopted professional learning communities and in my coursework I learned how to use PLCs to meet the challenges facing our schools (DuFour & Marzano, 2011). I joined the school leadership team and learned that high quality, data-driven instruction and strong school culture where learning flourishes must be built simultaneously and nurtured continuously

(Bambrick-Santoyo, 2012). As a teacher leadership doctoral candidate I have learned collaborative leadership based on evidence is most effective in producing change.

The Project's Potential Impact on Social Change

This study and resulting project could contribute to positive social change for rural mathematics teachers by creating an environment to encourage personal reflection and collaboration with local and virtual colleagues, enhancing their SoC and ultimately improving mathematical instructional practices (Hodges & Cady, 2013; Nistor et al., 2015a). The mathematics teachers could also share these improved instructional practices with mathematics teachers at other levels as well as teachers in other disciplines thereby improving school experiences for students throughout SSD. Improved instructional practices can increase students' engagement and enjoyment of school, also increasing achievement (Capraro et al., 2016). Mathematics teachers who participate in personal reflection, collaborate with likeminded teachers, and engage in effective continuing PD may increase their confidence and self-efficacy to teach all their students (Main & Pendergast, 2015).

According to Fullan (2016), "Large scale reform is about shared meaning, which means it involves simultaneously individual and social change" (p.11). In the larger context, the study and resulting project could also contribute to positive social change for the informal mathematics teacher blogging community at large. Other members of the vCoP could adapt the module to use in their own district or region to increase social media use intention with other math teachers. Southwestern School District middle school math teachers could contribute meaningfully to the SoC creating positive social change in the vCoP at large.

Implications, Applications, and Directions for Future Research

The importance of my study is the contribution to the body of work of researchers studying social media use intention and use behavior, particularly related to teachers. The US Department of Education is actively encouraging teachers to participate in informal vCoP as PD. Therefore, it is becoming increasing important to understand what draws teachers to blogging and keeps them engaged in their informal vCoP. My study found performance expectancy, effort expectancy, and intrinsic motivation to be predictive constructs of social media use intention of math teacher bloggers. The findings of this study are consistent with the findings of other technology acceptance researchers.

In contrast, no predictive factors of social media use behavior were identified in my study. The gap between technology use intention and use behavior has been identified and described by previous researchers. Additionally, it is important to note that I gathered my social media use behavior data using the ReaderBench automated tool. Many previous studies used self-reported data of use behavior.

Directions for future research include expanding and exploring the information available from the automated tool, creating ways to better understand and measure the participation of receptive users, and using an alternative model to study social media use intention and behavior of teacher bloggers. The ReaderBench automated tool has capabilities for collecting data significantly beyond the simple count that I used for the social media use behavior construct. For further research, it would be worthwhile to explore the automated data to analyze the quality of the collaborative dialog in the vCoP.

Next the informal vCoP, which was the setting for my study, involved blog authors, commenters, and readers. While it was straightforward to analyze the contributions of the generative users, the receptive users (blog readers) provide a unique challenge to researchers. In the future, I would like to study how receptive users participate in the blogging community and whether they make instructional changes similar to blog authors and commenters. Finally, I am interested in studying the relatively new CoP model to teachers' informal blogging communities (Nistor et al., 2014a).

Conclusion

This project study provided a vehicle to explore the predictive factors of mathematics teachers social media use intention and create a PD module to provide opportunities for teachers focused on those factors. While the study was limited in population and scale, when set within the body of research, it provides a picture of the predictive factors for social media use intention, specifically blogging to improve instruction. These insights were used to create a focused PD module harnessing the power of technology to connect math teachers with virtual colleagues through blogging. The PD module makes use of 21st century technology available to teachers to connect them with virtual colleagues through informal vCoP to reflect on teaching and improve instruction. Rural middle school mathematics teachers create and strengthen relationships with virtual and local colleagues creating a sense of community. Through these interactions teachers become more reflective and curious, and the school culture becomes conducive to positive social change.

References

Agudo-Peregrina, Á. F., Hernández-García, Á., & Pascual-Miguel, F. J. (2014). Behavioral intention, use behavior and the acceptance of electronic learning systems: Differences between higher education and lifelong learning. *Computers in Human Behavior*, *34*, 301-314. doi:10.1016/j.chb.2013.10.035

Aharony, N. (2014). The effect of personal and situational factors on LIS students' and professionals' intentions to use e-books. *Library & Information Science Research, 36*(2), 106-113. doi:10.1016/j.lisr.2014.01.001

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211. doi:10.1016/0749-5978(91)90020-t

Ajzen, I. (2011). The theory of planned behaviour: reactions and reflections. *Psychology & Health*, *26*(9), 1113-1127. doi:10.1080/08870446.2011.613995

Akiba, M., Wang, Z., & Liang, G. (2015). Organizational resources for professional development: A Statewide longitudinal survey of middle school mathematics teachers. *Journal of School Leadership 25*, (2), 252-285. Retrieved from https://journals.rowman.com/products/authors/560359-journal-of-school-leadership/list

Albion, P. R., Tondeur, J., Forkosh-Baruch, A., & Peeraer, J. (2015). Teachers' professional development for ICT integration: towards a reciprocal relationship between research and practice. *Education and Information Technologies*, *20*(4), 655-673. doi:10.1007/s10639-015-9401-9

Aljukhadar, M., Senecal, S., & Nantel, J. (2014). Is more always better? Investigating the task-technology fit theory in an online user context. *Information & Management*, *51*(4), 391-397. doi:10.1016/j.im.2013.10.003

Archibald, S., Coggshall, J., Croft, A., & Goe, L. (2011). *High quality professional development for all teachers: Effectively allocating resources* [Research & Policy Brief]. Retrieved from http://www.gtlcenter.org/sites/default/files/docs/HighQualityProfessionalDevelopment.pdf

Atkins, D. E. (2010). *Transforming American education: Learning powered by technology* (Report No. ED-04-CO-0040). Retrieved from http://www.ed.gov/sites/default/files/netp2010.pdf

Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and well-being in two work settings. *Journal of Applied Social Psychology*, *34*(10), 2045-2068. doi:10.1111/j.1559-1816.2004.tb02690.x

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems, 8*(4), 244-254. Retrieved from http://aisel.aisnet.org/jais/

Ball, D. L., & Cohen, D. K. (1996). Reform by the book: What is or might be the role of curriculum materials in teacher learning and instructional reform? *Educational Researcher, 25*(9), 6-14. doi.:10.3102/0013189x025009006

Bambrick-Santoyo, P. (2012). Leverage leadership: A practical guide to building exceptional schools. San Francisco, CA: Jossey-Bass.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, *37*(2), 122-147. doi:10.1037/0003-066X.37.2.122

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (2006). On integrating social cognitive and social diffusion theories. In A. Singhal, & J. Dearing (Eds.), *Communication of innovation: A journey with Rogers* (pp. 111-135). Thousand Oaks, CA: Sage Publications.

Barrett, N., Cowen, J., Toma, E., & Troske, S. (2015). Working with what they have: Professional development as a reform strategy in rural schools. *Journal of Research in Rural Education*, *30*(10), 1-18. Retrieved from http://jrre.vmhost.psu.edu/wp-content/uploads/2015/08/30-10.pdf

Bates, M. S., Phalen, L., & Moran, C. (2016). Online professional development: A primer. *Phi Delta Kappan*, *97*(5), 70-73. doi:10.1177/0031721716629662

Baumer, E. P., Sueyoshi, M., & Tomlinson, B. (2011). Bloggers and readers blogging together: Collaborative co-creation of political blogs. *Computer Supported Cooperative Work, 20*(1-2), 1-36. doi:10.1007/s10606-010-9132-9

Beach, R. (2012). Can online learning communities foster professional development? *Language Arts, 89*(4), 256-262. Retrieved from http://www.ncte.org/journals/la/

Beaudry, A., & Pinsonneault, A. (2010). The other side of acceptance: Studying the direct and indirect effects of emotions on information technology use. *MIS Quarterly*, *34*(4), 689-710. Retrieved from http://www.misq.org

Bereiter, C. (2002). *Education and mind in the knowledge age*. New York, NY:

Routledge.

Blanchard, M., LePrevost, C., Tolin, A. D., Gutierrez, K., (2016). Investigating technology-enhanced teacher professional development in rural, high-poverty middle schools. *Educational Researcher, 45*(3) 207-220. doi:10.3102/0013189x16644602

Blitz, C. L. (2013). *Can online learning communities achieve the goals of traditional professional learning communities? What the literature says*. (REL 2013-003). Washington, D. C: U.S. Department of Education, Institute of Education Sciences, National Center for Education, Evaluation, and Regional Assistance.

Boesen, J., Helenius, O., Bergqvist, E., Bergqvist, T., Lithner, J., Palm, T., & Palmberg, B. (2014). Developing mathematical competence: From the intended to the enacted curriculum. *The Journal of Mathematical Behavior*, *33*, 72-87. doi:10.1016/j.jmathb.2013.10.001

Boston, M. D. (2013). Connecting changes in secondary mathematics teachers' knowledge to their experiences in a professional development workshop. *Journal of Mathematics Teacher Education*, *16*(1), 7-31. doi.:10.1007/s10857-012-9211-6

Bourgonjon, J., De Grove, F., De Smet, C., Van Looy, J., Soetaert, R., & Valcke, M. (2013). Acceptance of game-based learning by secondary school teachers. *Computers & Education*, *67*, 21-35. doi:10.1016/j.compedu.2013.02.010

Brew, A. (2010). Transforming academic practice through scholarship. *International Journal for Academic Development, 15*(2), 105-116. doi:10.1080.13601441003737618

Brown, J. D. (2011). Likert items and scales of measurement? *SHIKEN: JALT Testing and Evaluation SIG Newsletter, 15*(1), 10–14. Retrieved from http://jalt.org/test/pub.htm

Byington, T. A. (2011). Communities of practice: Using blogs to increase collaboration. *Intervention in School & Clinic*, *46*(5), 280-291. doi:10.1177/1053451210395384

Capraro, R., Capraro, M., Scheurich, J., Jones, M., Morgan, J., Huggins, K., ... & Han, S. (2016). Impact of sustained professional development in STEM on outcome measures in a diverse urban district. *Journal of Educational Research, 109*(2), 181-196. doi:10.1080/00220671.2014.936997

Chai, S., Das, S., & Rao, H. R. (2011). Factors affecting bloggers' knowledge sharing: An investigation across gender. *Journal of Management Information Systems*, *28*(3), 309-342. doi:10.2753/mis0742-1222280309

Chen, K. C., & Jang, S. J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior*, *26*(4), 741–752. doi:10.1016/j.chb.2010.01.011

Chen, C. P., Lai, H. M., & Ho, C. Y. (2015). Why do teachers continue to use teaching blogs? The roles of perceived voluntariness and habit. *Computers & Education*, *82*(1), 236-249. doi:10.1016/j.compedu.2014.11.017

Ching, C. C., & Hursh, A. W. (2014). Peer modeling and innovation adoption among teachers in online professional development. *Computers & Education*, *73*, 72-82. doi:10.1016/j.compedu.2013.12.011

Ciampa, K., & Gallagher, T. L. (2015). Blogging to enhance in-service teachers' professional learning and development during collaborative inquiry. *Educational Technology Research and Development, 63*(6), 883-913. doi:10.1007/s11423-015-9404-7

Class, B., & Schneider, D. (2014). Design issues for technology-enhanced professional development. *Journal of Interactive Learning Research*, *25*(2), 161-186. Retrieved from http://www.aace.org/pubs/jilr/

Coburn, C. E., Mata, W. S., & Choi, L. (2013). The Embeddedness of teachers' social networks: Evidence from a study of mathematics reform. *Sociology of Education*, *86*(4), 311-342. doi:10.1177/0038040713501147

Cogan, L., Schmidt, W., & Houang, R. (2013). *Implementing the Common Core State Standards for Mathematics: What we know about teachers of mathematics in 41 states.* East Lancing, MI: The Education Policy Center at Michigan State University.

Conference Board of the Mathematical Sciences. (2012). *Issues in mathematics education: The mathematical education of teachers II.* Retrieved from http://www.cbmsweb.org/MET2/met2.pdf

Conley, D. T. (2011). Building on the Common Core. *Educational Leadership*, *68*(6), 16-20. Retrieved from http://www.ascd.org/publications/educational-leadership.aspx

Creswell, J. W. (2009). *Research design: Qualitative, quantitative and mixed method approaches* (3rd ed.). Los Angeles, CA: Sage Publications.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Boston, MA: Pearson Education.

Curwood, J. (2013). Applying the design framework to technology professional development. *Journal of Digital Learning in Teacher Education*, *29*(3), 89-96. doi:10.1080/21532974.2013.10784710

Danielson, C. (2013). *Framework for teaching.* Retrieved from http://www.danielsongroup.org/framework/

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). State of the profession: Study measures status of professional development. *Journal of Staff Development*, *30*(2), 42-50. Retrieved from http://learningforward.org/publications/jsd

Daro, P. (2011). Forward. In P. Sztajn, K. Marrongelle, P. Smith, & B. Melton (Eds). *Supporting implementation of the common core state standards for mathematics: Recommendations for professional development*. Retrieved from http://cadrek12.org/sites/default/files/CCSS%20Math.pdf

Dascălu, M., Trăușan-Matu, Ș., & Dessus, P. (2010). Utterances assessment in chat conversations. *Research in Computing Science, 46*, 323-334. Retrieved from http://www.micai.org/rcs/

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340. doi:/10.2307/249008

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*(8), 982-1003. doi:10.1287/mnsc.35.8.982

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne, 49*(3), 182-185. doi:10.1037/a0012801

Deci, E. L., & Ryan, R. M. (2012). Motivation, personality, and development within embedded social contexts: An overview of self-determination theory. In R. M. Ryan (Ed.), *The Oxford handbook of human motivation* (pp. 85-107). New York, NY: Oxford University Press.

Deng, L., & Yuen, A. H. (2011). Towards a framework for educational affordances of blogs. *Computers & Education*, *56*(2), 441-451. doi:10.1016/j.compedu.2010.09.005

Denning, P. (1983). A nation at risk: The imperative for educational reform. *Communications of the ACM*, *26*(7), 469-478. Retrieved from http://cacm.acm.org/

Drexler, W., Baralt, A., & Dawson, K. (2008). The Teach Web 2.0 Consortium: A tool to promote educational social networking and Web 2.0 use among educators. *Educational Media International*, *45*(4), 271-283. doi:10.1080/09523980802571499

DuFour, R., & Marzano, R. (2011). *Leaders of learning: How district, school, and classroom leaders improve student achievement.* Bloomington, IN: Solution Tree Press.

Duncan-Howell, J. (2010). Teachers making connections: Online communities as a source of professional learning. *British Journal of Educational Technology*, *41*(2), 324-340. doi:10.1111/j.1467-8535.2009.00953.x

Duran, M., Brunvand, S., Ellsworth, J., & Şendağ, S. (2011). Impact of research-based professional development: Investigation of inservice teacher learning and practice in Wiki integration. *Journal of Research on Technology in Education*, *44*(4), 313-334. doi:10.1080/15391523.2012.10782593

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, *59*(2), 423-435. doi:10.1016/j.compedu.2012.02.001

Fan, W., & Yan, Z. (2010). Factors affecting response rates of the web survey: A systematic review. *Computers in Human Behavior*, *26*(2), 132-139. doi:10.1016/j.chb.2009.10.015

Faqih, K. M., & Jaradat, M. (2015). Assessing the moderating effect of gender differences and individualism-collectivism at individual-level on the adoption of mobile commerce technology: TAM3 perspective. *Journal of Retailing and Consumer Services*, *22*, 37-52. doi:10.1016/j.jretconser.2014.09.006

Fink, A. (2012). *How to conduct surveys: A step-by-step guide* (5th ed.). Los Angeles, CA: Sage Publications.

Fishbein, M., & Ajzen, I. (1977). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Fishman, B., Konstantopoulos, S., Kubitskey, B. W., Vath, R., Park, G., Johnson, H., & Edelson, D. C. (2013). Comparing the impact of online and face-to-face professional development in the context of curriculum implementation. *Journal of Teacher Education*, *64*(5), 426-438. doi:10.1177/0022487113494413

Franklin, T., & van Harmelen, M. (2007). *Web 2.0 for content for learning and teaching in higher education* (Research Report). Retrieved from https://www.jisc.ac.uk/media/documents/programmes/digitalrepositories/web2-content-learning-and-teaching.pdf

Fullan, M. (2016). *The new meaning of educational change* (5th ed.). New York, NY: Teachers College Press.

Furneaux, B. (2012). Task-technology fit theory: A survey and synopsis of the literature. In Y. Dwivedi, M. Wade, & S. Schneberger (Eds.), *Information systems theory: Explaining and predicting our digital society* (pp. 87-106). New York, NY: Springer.

Garet, M. S., Wayne, A. J., Stancavage, F., Taylor, J., Eaton, M., Walters, K., ... & Doolittle, F. (2011). *Middle school mathematics professional development impact study: Findings after the second year of implementation* (NCEE 2011-4025). Retrieved from http://ies.ed.gov/ncee/pubs/20114024/index.asp

Gersten, R., Taylor, M. J., Keys, T. D., Rolfhus, E., & Newman-Gonchar, R. (2014). *Summary of research on the effectiveness of math professional development approaches* (REL 2014-010). Retrieved from http://ies.ed.gov/ncee/edlabs.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly, 19*(2), 213-236. doi:10.2307/249689

Gorozidis, G., & Papaioannou, A. G. (2014). Teachers' motivation to participate in training and to implement innovations. *Teaching and Teacher Education*, *39*, 1-11. doi:10.1016/j.tate.2013.12.001

Gray, L., Thomas, N., & Lewis, L. (2010). *Teachers' use of educational technology in US public schools: 2009* (NCES 2010-040). Retrieved from http://nces.ed.gov/pubs2010/2010040.pdf

Green, S.B., & Salkind, N. (2013). *Using SPSS for Windows and Macintosh: Analyzing and understanding data* (7th ed.). Boston, MA: Pearson Education.

Gruzd, A., Staves, K., & Wilk, A. (2012). Connected scholars: Examining the role of social media in research practices of faculty using the UTAUT model. *Computers in Human Behavior*, *28*(6), 2340-2350. doi:10.1016/j.chb.2012.07.004

Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: Theory and Practice, 8*(3), 381-391. doi:10.1080/135406002100000512

Hagger, M. S., & Chatzisarantis, N. L. (2009). Integrating the theory of planned behavior and self-determination theory in health behaviour: A meta-analysis. *British Journal of Health Psychology, 14*(2), 275-302. doi:10.1348/135910708x373959

Hale, J. L., Householder, B. J., & Greene, K. L. (2002). The theory of reasoned action. In J. Dillard & M Pfau (Eds.), *The persuasion handbook: Developments in theory and practice* (pp. 259-286). Thousand Oaks, CA: Sage.

Hall, J. N. (2010). Investigating internal accountability and collective capacity: Taking a closer look at mathematics instruction. *Journal of Curriculum and Instruction*, *4*(2), 9-32. doi:10.3776/joci.2010.v4n2p9-32

Hanuscin, D. L., Cheng, Y. W., Rebello, C., Sinha, S., & Muslu, N. (2014). The affordances of blogging as a practice to support ninth-grade science teachers' identity development as leaders. *Journal of Teacher Education, 65*(3), 207-222. doi:10.1177/0022487113519475

Hanraets, I., Hulsebosch, J., & de Laat, M. (2011). Experiences of pioneers facilitating teacher networks for professional development. *Educational Media International*, *48*(2), 85-99. doi:10.1080/09523987.2011.576513

Harris, A., & Rodriguez, N. (2011). *Implementing Common Core State Standards and assessments: A workbook for state and district leaders*. Retrieved from ERIC database. (ED527109)

Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics*, *95*(7), 798-812. doi:10.1037/e722772011-001

Harrison, C., Tomás, C., & Crook, C. (2014). An e-maturity analysis explains intention–behavior disjunctions in technology adoption in UK schools. *Computers in Human Behavior*, *34*, 345-351. doi:10.1016/j.chb.2013.10.042

Herbel-Eismann, B., Steele, M., Cirillo, M. (2013). Developing teacher discourse moves: A Framework for professional development. *Mathematics Teacher Educator 2*(1),181-196. Retrieved from https://amte.net/publications/mte

Hill, H. C., Beisiegel, M., & Jacob, R. (2013). Professional development research consensus, crossroads, and challenges. *Educational Researcher*, *42*(9), 476-487. doi:10.3102/0013189x13512674

Hilliard, A. T. (2015). Global blended learning practices for teaching and learning, leadership, and professional development. *Journal of International Education Research*, *11*(3), 179-188. doi:10.19030/jier.v11i3.9369

Hodges, T. E., & Cady, J. (2013). Blended-format professional development and the emergence of communities of practice. *Mathematics Education Research Journal*, *25*(2), 299-316. doi:10.1007/s13394-012-0065-0

Holden, H., & Rada, R. (2011). Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance. *Journal of Research on Technology in Education*, *43*(4), 343-367. doi:10.1080/15391523.2011.10782576

Huang, W. H. D., Hood, D. W., & Yoo, S. J. (2014). Motivational support in Web 2.0 learning environments: A regression analysis based on the integrative theory of motivation, volition and performance. *Innovations in Education and Teaching International*, *51*(6), 631-641. doi:10.1080/14703297.2013.796718

Huffman, A. H., Whetten, J., & Huffman, W. H. (2013). Using technology in higher education: The influence of gender roles on technology self-efficacy. *Computers* *in Human Behavior*, *29*(4), 1779-1786. doi:10.1016/j.chb.2013.02.012

Hughes, G., Brendefur, J., & Carney, M. (2015). Reshaping teachers' mathematical perceptions: Analysis of a professional development task. *Mathematics Teacher Educator*, *3*(2), 116-129. doi:10.5951/mathteaceduc.3.2.0116

Hunt-Barron, S., Tracy, K. N., Howell, E., & Kaminski, R. (2015). Obstacles to enhancing professional development with digital tools in rural landscapes. *Journal of Research in Rural Education*, *30*(2), 1-14. Retrieved from http://jrre.psu.edu/

Hur, J. W., & Brush, T. A. (2009). Teacher participation in online communities: Why do teachers want to participate in self-generated online communities of K-12 teachers? *Journal of Research on Technology in Education*, *41*(3), 279-303. doi:10.1080/15391523.2009.10782532

Hur, J. W., Brush, T., & Bonk, C. (2012). An analysis of teacher knowledge and emotional sharing in a teacher blog community. In V. Dennen & J. Myers (Eds.), *Virtual professional development and informal learning via social networks* (pp. 219-239). Hershey, PA: Information Science Reference.

Jackson, K., Garrison, A., Wilson, J., Gibbons, L., & Shahan, E. (2013). Exploring relationships between setting up complex tasks and opportunities to learn in concluding whole-class discussions in middle-grades mathematics instruction. *Journal for Research in Mathematics Education*, *44*(4), 646-682. doi:10.5951/jresematheduc.44.4.0646

Johnson, C. M. (2001). A survey of current research on online communities of practice.

The Internet and Higher Education, *4*(1), 45-60. doi:10.1016/S1096-7516(01)00047-1

Johnson, K., Hays, C., Center, H., & Daley, C. (2004). Building capacity and sustainable prevention innovations: A sustainability planning model. *Evaluation and Program Planning*, *27*(2), 135–149. doi:10.1016/j.evalprogplan.2004.01.002.

Kane, T. J., Taylor, E. S., Tyler, J. H., & Wooten, A. L. (2011). Identifying effective classroom practices using student achievement data. *Journal of Human Resources*, *46*(3), 587-613. doi:10.3386/w15803

Karaman, T. (2011, September). Use of blogs in teacher education to reflect on teaching practices. Proceedings from *5th International Computer & Instructional Technologies Symposium*. Retrieved from http://web.firat.edu.tr/icits2011/papers/27698.pdf

Kerawalla, L., Minocha, S., Kirkup, G., & Conole, G. (2009). An empirically grounded framework to guide blogging in higher education. *Journal of Computer Assisted Learning, 25* (1), 31-42. doi:10.1111/j.1365-2729.2008.00286.x

Knight, S., Lloyd, G., Arbaugh, F., Edmondson, J., McDonald, S. P., Nolan, J., & Whitney, A. E. (2013). Teacher learning and standards-based instruction. *Journal of Teacher Education*, *64*(3), 200-201. doi:10.1177/0022487113480461

Kreijns, K., Vermeulen, M., Van Acker, F., & van Buuren, H. (2014). Predicting teachers' use of digital learning materials: Combining self-determination theory and the integrative model of behaviour prediction. *European Journal of Teacher Education*, *37*(4), 465-478. doi:10.1080/02619768.2014.882308

Lai, H. M., & Chen, C. P. (2011). Factors influencing secondary school teachers' adoption of teaching blogs. *Computers & Education*, *56*(4), 948-960. doi:10.1016/j.compedu.2010.11.010

Lauer, P. A., Christopher, D. E., Firpo-Triplett, R., & Buchting, F. (2014). The impact of short-term professional development on participant outcomes: a review of the literature. *Professional Development in Education*, *40*(2), 207-227. doi:10.1080/19415257.2013.776619

Learning Forward. (2011). *Standards for professional learning* (3rd ed.). Retrieved from http://learningforward.org/standards-for-professional-learning

Lee, Y. H., Hsieh, Y. C., & Hsu, C. N. (2011). Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems. *Educational Technology & Society, 14*(4), 124–137. Retrieved from http://www.ifets.info/index.php

Lee, H. (2014). Conceptual framework of blended professional development for mathematics teachers. *Journal of Asynchronous Learning Networks*, *17*(4), 81-92. Retrieved from http://olc.onlinelearningconsortium.org/publications/olj_main

Le Fevre, D. M. (2014). Barriers to implementing pedagogical change: The role of teachers' perceptions of risk. *Teaching and Teacher Education*, *38*, 56-64. doi:10.1016/j.tate.2013.11.007

Liebtag, E. (2013). Moving forward with Common Core State Standards implementation: Possibilities and potential problems. *Journal of Curriculum & Instruction*, *7*(2), 56-70. doi:10.3776/joci.2013.v7n2p56-70

Lin, M. J. J., Hung, S. W., & Chen, C. J. (2009). Fostering the determinants of knowledge sharing in professional virtual communities. *Computers in Human Behavior*, *25*(4), 929-939. doi:10.1016/j.chb.2009.03.008

Lin, K. Y., & Lu, H. P. (2011). Why people use social networking sites: An empirical study integrating network externalities and motivation theory. *Computers in Human Behavior*, *27*(3), 1152-1161. doi:10.1016/j.chb.2010.12.009

Lin, W. S., & Wang, C. H. (2012). Antecedences to continued intentions of adopting e-learning system in blended learning instruction: A contingency framework based on models of information system success and task-technology fit. *Computers & Education*, *58*(1), 88-99. doi:10.1016/j.compedu.2011.07.008

Lodico, M., Spaulding, D. T., & Voegtle, K. H. (2010). *Methods in educational research: From theory to practice* (Laureate Education, Inc., custom ed.). San Francisco, CA: John Wiley & Sons.

Lu, H. P., & Yang, Y. W. (2014). Toward an understanding of the behavioral intention to use a social networking site: An extension of task-technology fit to social-technology fit. *Computers in Human Behavior*, *34*, 323-332. doi:10.1016/j.chb.2013.10.020

Luebeck, J., Cobbs, G., Scott, L., & Schools, B. P. (2015, March). Closing the distance: Online learning for rural mathematics teachers. In *Society for Information Technology & Teacher Education International Conference* (Vol. 2015, No. 1, pp. 55-60). Retrieved from http://www.editlib.org/p/149966/proceeding_149966.pdf

Luehmann, A. (2008) Using blogging in support of teacher professional identity development: A case study. *Journal of the Learning Sciences, 17*(3), 287-337. doi:10.1080/10508400802192706

Luehmann, A., & Borasi, R. (Eds.). (2011). *Blogging as change: Transforming science and math education through new media literacies.* New York, NY: Peter Lang Publishing.

Luehmann, A. L., & Tinelli, L. (2008). Teacher professional identity development with social networking technologies: Learning reform through blogging. *Educational Media International*, *45*(4), 323-333. doi:10.1080/09523980802573263

Main, K., & Pendergast, D. (2015). Core features of effective continuing professional development for the middle years: A Tool for reflection. *Research In Middle Level Education Online 38*(10), 1-18. doi:10.1080/19404476.2015.11658177

Males, L., Otten, S., & Herbel-Eisenmann, B. (2010). Challenges of critical colleagueship: Examining and reflecting on mathematics teacher study group interactions. *Journal of Mathematics Teacher Education*, *13*(6), 459-471. doi:10.1007/s10857-010-9156-6

Marquis, E., Healey, M., & Vine, M. (2016). Fostering collaborative teaching and learning scholarship through an international writing group initiative. *Higher Education Research & Development*, *35*(3), 531-544. doi:10.1080/07294360.2015.1107886

Marrongelle, K., Sztajn, P., & Smith, M. (2013). Scaling up professional development in an era of common state standards. *Journal of Teacher Education*, *64*(3), 202-211. doi:10.1177/0022487112473838

Mathieson, K., & Keil, M. (1998). Beyond the interface: Ease of use and task/technology fit. *Information & Management*, *34*(4), 221-230. doi:10.1016/s0378-7206(98)00058-5

Matzat, U. (2013). Do blended virtual learning communities enhance teachers' professional development more than purely virtual ones? A large scale empirical comparison. *Computers & Education*, *60*(1), 40-51. doi:10.1016/j.compedu.2012.08.006

McConnell, T. J., Parker, J. M., Eberhardt, J., Koehler, M. J., & Lundeberg, M. A. (2013). Virtual professional learning communities: Teachers' perceptions of virtual versus face-to-face professional development. *Journal of Science Education and Technology*, *22*(3), 267-277. doi:10.1007/s10956-012-9391-y

McMillan, D. W. (2011). Sense of community, a theory not a value: A response to Nowell and Boyd. *Journal of Community Psychology, 39*(5), 507-519. doi:10.1002/jcop.20439

Melchor-Ferrer, E., & Buendía-Carrillo, D. (2014). Financial information management for university departments, using open-source software. *International Journal of Information Management*, *34*(2), 191-199. doi:10.1016/j.ijinfomgt.2013.12.009

Meneses, J., Fàbregues, S., Rodríguez-Gómez, D., & Ion, G. (2012). Internet in teachers' professional practice outside the classroom: Examining supportive and management uses in primary and secondary schools. *Computers & Education*, *59*(3), 915-924. doi:10.1016/j.compedu.2012.04.011

Mertens, D. (2010). *Research and evaluation in education and psychology* (3rd ed.). Los Angeles, CA: Sage Publications.

Michaels, S., & O'Connor, C. (2013). Conceptualizing talk moves as tools: Professional development approaches for academically productive discussion. In L. B. Resnick, C. Asterhan, & S. Clarke (Eds.), *Socializing Intelligence Through Academic Talk and Dialogue* (pp. 333-347). Washington, DC: American Educational Research Association.

Mitchell, T. R. (1982). Motivation: New directions for theory, research, and practice. *Academy of Management Review*, *7*(1), 80-88. doi:10.2307/257251

MMS Education. (2012). *2012 Survey of K-12 educators on social networking, online communities, and Web 2.0 tools*. Retrieved from http://www.edweb.net/fimages/op/reports /Educators-and-Social-Media2012-web.pdf

Muijs, D. (2011). *Doing quantitative research in education using SPSS* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Murillo Montes de Oca, A., & Nistor, N. (2014). Non-significant intention–behavior effects in educational technology acceptance: A case of competing cognitive scripts? *Computers in Human Behavior*, *34*, 333-338. doi:10.1016/j.chb.2014.01.026

Murugesan, S. (2007). Understanding Web 2.0. *IT Professional*, 9(4), 34-41.

doi:10.1109/MITP.2007.78

Nair, I., & Das, V. M. (2011). Analysis of recent studies undertaken for assessing acceptance of technology among teachers using TAM. *International Journal of Computer Applications*, *32*(8), 38-46. Retrieved from http://ijcaonline.org

Nathans, L., Oswald, F., & Nimon, K. (2012). Interpreting multiple linear regression: A guidebook of variable importance. *Practical Assessment, Research, & Evaluation,* 17(9), 1-19. Retrieved from http://pareonline.net/

National Council of Teachers of Mathematics. (1980). *An agenda for action.* Reston, VA: Author. Retrieved from http://www.nctm.org/standards/content.aspx?id=17278

National Governors Association Center for Best Practices (NGA Center) and Council of Chief State School Officers (CCSSO). 2010. *Common core state standards for mathematics.* Washington, D.C.: NGA Center and CCSSO. Retrieved from http://www.corestandards.org.

Neves de Jesus, S., & Lens, W. (2005). An integrated model for the study of teacher motivation. *Applied Psychology, 54*(1), 119-134. doi:10.1111/j.1464-0597.2005.00199.x

Nistor, N., Baltes, B., Dascălu, M., Mihăilă, D., Smeaton, G., & Trăuşan-Matu, Ş. (2014a). Participation in virtual academic communities of practice under the influence of technology acceptance and community factors. A learning analytics application. *Computers in Human Behavior*, *34*, 339-344. doi:10.1016/j.chb.2013.10.051

Nistor, N., Baltes, B., & Schustek, M. (2012). Knowledge sharing and educational technology acceptance in online academic communities of practice. *Campus-Wide Information Systems*, *29*(2), 108-116. doi:10.1108/10650741211212377

Nistor, N., Daxecker, I., Stanciu, D., & Diekamp, O. (2015a). Sense of community in academic communities of practice: Predictors and effects. *Higher Education, 69*(2), 257-273. doi:10.1007/s10734-014-9773-6

Nistor, N., & Fischer, F. (2012). Communities of practice in academia: Testing a quantitative model. *Learning, Culture and Social Interaction, 1*(2), 114-126. doi:10.1016/j.lcsi.2012.05.005

Nistor, N., Göğüş, A., & Lerche, T. (2013). Educational technology acceptance across national and professional cultures: A European study. *Educational Technology Research and Development, 61*(4) 733-749. doi:10.1007/s11423-013-9292-7

Nistor, N., Lerche, T., Weinberger, A., Ceobanu, C., & Heymann, O. (2014b). Towards the integration of culture into the Unified Theory of Acceptance and Use of Technology. *British Journal of Educational Technology*, *45*(1), 36-55. doi:10.1111/j.1467-8535.2012.01383.x

Nistor, N., Trăuşan-Matu, Ş., Dascălu, M., Duttweiler, H., Chiru, C., Baltes, B., & Smeaton, G. (2015b). Finding student-centered open learning environments on the Internet: Automated dialogue assessment in academic virtual communities of practice. *Computers in Human Behavior, 47*, 119-127. doi:10.1016/j.chb.2014.07.029

NMPED Student Nutrition Bureau. (2012). *New Mexico Department of Education Child Nutrition Programs: Approved Free and Reduced Percentages*. Retrieved from http://www.ped.state.nm.us/it/dl11/FreeRedPct_2012.pdf

O'Reilly, T. (2007). What is Web 2.0: Design patterns and business models for the next generation of software. *Communications & Strategies, 1*, 17-38. Retrieved from http://mpra.ub.uni-muenchen.de/4578/

Paavola, S., Lipponen, L., & Hakkarainen, K. (2004). Models of innovative knowledge communities and three metaphors of learning. *Review of Educational Research, 74*(4), 557-576. doi:10.3102/00346543074004557

Park, S. Y., Nam, M. W., & Cha, S. B. (2012). University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model. *British Journal of Educational Technology*, *43*(4), 592-605. doi:10.1111/j.1467-8535.2011.01229.x

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, *63*, 539-569. doi:10.1146/annurev-psych-120710-100452

Polikoff, M. S. (2013). Teacher education, experience, and the practice of aligned instruction. *Journal of Teacher Education*, *64*(3), 212-225. doi:10.1177/0022487112472908

Porter, A., McMaken, J., Hwang, J., & Yang, R. (2011a). Common Core Standards: The new US intended curriculum. *Educational Researcher*, *40*(3), 103-116. doi:10.3102/0013189x11405038

Porter, A., McMaken, J., Hwang, J., & Yang, R. (2011b). Assessing the Common Core Standards opportunities for improving measures of instruction. *Educational Researcher*, *40*(4), 186-188. doi:10.3102/0013189x11410232

Prestridge, S. (2014). Reflective blogging as part of ICT professional development to support pedagogical change. *Australian Journal of Teacher Education, (39)*2, 70-86. doi:10.14221/ajte.2014v39n2.4

Project Tomorrow. (2011). *The new 3 #'s of education: Enabled, engaged, empowered – how todays educators are advancing a new vision for teaching and learning. Speak Up 2010 National Findings*. Retrieved from http://www.tomorrow.org/speakup/speakup_reports.html

Pynoo, B., Devolder, P., Tondeur, J., Van Braak, J., Duyck, W., & Duyck, P. (2011). Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study. *Computers in Human Behavior*, *27*, 568-575. doi:10.1016/j.chb.2010.10.005

Pynoo, B., Tondeur, J., Van Braak, J., Duyck, W., Sijnave, B., & Duyck, P. (2012). Teachers' acceptance and use of an educational portal. *Computers & Education*, *58*(4), 1308-1317. doi:10.1016/j.compedu.2011.12.026

Pynoo, B., & van Braak, J. (2014). Predicting teachers' generative and receptive use of an educational portal by intention, attitude and self-reported use. *Computers in Human Behavior*, *34*, 315-322. doi:10.1016/j.chb.2013.12.024

Reich, J., Murnane, R., & Willett, J. (2012). The state of wiki usage in U.S. K–12 schools: Leveraging Web 2.0 data warehouses to assess quality and equity in online learning environments. *Educational Researcher, 41*(1), 7-15. doi:10.3102/0013189x11427083

Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research*, *75*(2), 211-246. doi:10.3102/00346543075002211

Rheingold, H. (2000). *The virtual community: Homesteading on the electronic frontier, revised edition.* Cambridge, MA: The MIT Press.

Ritchie, S. (2012). Incubating and sustaining how teacher networks enable and support social justice education. *Journal of Teacher Education*, *63*(2), 120-131. doi:10.1177/0022487111428327

Rogers, E. (1962). *Diffusion of innovations*. New York, NY: The Free Press.

Rogers, E. (2003). *Diffusion of innovations* (5th ed.). [Kindle DX version]. Retrieved from http://www.amazon.com/

Rothman, R. (2012). Nine ways the Common Core will change classroom practice. *New Hampshire Journal of Education*, *28*(4), 32-33. Retrieved from http://nhascd.net/content/new-hampshire-journal-education

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology*, *57*(5), 749. doi:10.1037/0022-3514.57.5.749

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. doi:10.1037/0003-066x.55.1.68

Sakiz, G., Pape, S., Hoy, A. (2010). Does perceived teacher affective support matter for middle school students in mathematics classrooms? *Journal of School Psychology, 50*(2), 235-255. doi:10.1016/j.jsp.2011.10.005

Sample McMeeking, L., Orsi, R., & Cobb, R. B. (2012). Effects of a teacher professional development program on the mathematics achievement of middle school students. *Journal for Research in Mathematics Education, 43*(2), 159 –181. doi:10.5951/jresematheduc.43.2.0159

Sánchez-Fernández, J., Muñoz-Leiva, F., & Montoro-Ríos, F. J. (2012). Improving retention rate and response quality in Web-based surveys. *Computers in Human Behavior*, *28*(2), 507-514. doi:10.1016/j.chb.2011.10.023

Schellenbach-Zell, J., & Gräsel, C. (2010). Teacher motivation for participating in school innovations-supporting factors. *Journal for Educational Research Online, 2*(2), 34-54. Retrieved from http://www.j-e-r-o.com/index.php/jero

Schmidt, M. (2013, November 13). Why I blog, for Kate [Blog post]. Retrieved from http://mathybeagle.com/2013/11/16/why-i-blog-for-kate/

Schmidt, W., & Houang, R. (2012). Curricular coherence and the Common Core State Standards for Mathematics. *Educational Researcher, 41*(8), 294–308. doi:10.3102/0013189x12464517

Schoenfeld, A. H. (2013). Mathematical modeling, sense making, and the Common Core State Standards. *Journal of Mathematics Education at Teachers College*, *4*(2), 6-17. Retrieved from http://journals.tc-library.org/index.php/matheducation

Shah, S. (2013, October 20). Welcome to mathtwitterblogosphere [Blog post]. Retrieved from http://mathtwitterblogosphere.weebly.com

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research 15*(3), 325-343. doi:10.1086/209170

Smith. A. (2013). *Strategic plan mini-audit: Middle school summary*. [unpublished raw data].

Smith, B. (2014). *120th Day Ethnicity Report: Grades 6-8* [unpublished raw data].

Smith, C. (2016). *Demographic Data of Math Teachers: Grades 6-8* [unpublished raw data].

Sørebø, Ø., Halvari, H., Gulli, V. F., & Kristiansen, R. (2009). The role of self-determination theory in explaining teachers' motivation to continue to use e-learning technology. *Computers & Education*, *53*(4), 1177-1187. doi:10.1016/j.compedu.2009.06.001

SSD. (2013). Strategic plan: July 2013 update. Retrieved from http://www.[redacted]/files /filesystem/July2013_Update_CompleteFile1.pdf

Straub, E. T. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research*, *79*(2), 625-649. doi:10.3102/0034654308325896

Stevens, T., Aguirre-Munoz, Z., Harris, G., Higgins, R., & Liu, X. (2013) Middle level mathematics teachers' self-efficacy growth through professional development: Differences based on mathematical background. *Australian Journal of Teacher*

*Education, (38)*4, 144-164. Retrieved from http://ro.ecu.edu.au/ajte/vol38/iss4/9

Sumak, B., Hericko, M., & Pusnik, M. (2011). A meta-analysis of e-learning technology acceptance: The role of user types and e-learning technology types. *Computers in Human Behavior, 27*(6), 2067–2077. doi:1016/j.chb.2011.08.005

Tarr, J. E., Chávez, Ó., Reys, R. E., & Reys, B. J. (2006). From the written to the enacted curricula: The intermediary role of middle school mathematics teachers in shaping students' opportunity to learn. *School Science and Mathematics*, *106*(4), 191-201. doi:10.1111/j.1949-8594.2006.tb18075.x

Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computers & Education*, *57*(4), 2432-2440. doi:10.1016/j.compedu.2011.06.008

Tsai, H. T., & Bagozzi, R. P. (2014). Contribution behavior in virtual communities: Cognitive, emotional and social influences. *MIS Quarterly*, *38*(1), 143-163. Retrieved from http://www.misq.org

Tseng, F. C., & Kuo, F. Y. (2014). A study of social participation and knowledge sharing in the teachers' online professional community of practice. *Computers & Education*, *72*, 37-47. doi:10.1016/j.compedu.2013.10.005

Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). Does the technology acceptance model predict actual use? A systematic literature review. *Information and Software Technology*, *52*(5), 463-479. doi:10.1016/j.infsof.2009.11.005

Twining, P., Raffaghelli, J., Albion, P., & Knezek, D. (2013). Moving education into the digital age: The contribution of teachers' professional development. *Journal of Computer Assisted Learning*, *29*(5), 426-437. doi:10.1111/jcal.12031

U.S. Department of Education, Office of Educational Technology. (2013). *Connected Educator Month report: Learning with connected and inspired educators*. Retrieved from http://www.ed.gov/edblogs/technology/research/

U.S. Department of Education, Office of Educational Technology. (2016). *Future ready learning: Reimagining the role of technology in education*. Retrieved from http://tech.ed.gov/netp/

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273-315. doi:10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186-204. doi:10.1287/mnsc.46.2.186.11926

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425-478. Retrieved from http://www.misq.org

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly, 36*(1), 157-178. Retrieved from http://www.misq.org

Vogt, W. P. (2007). *Quantitative research methods for professionals.* Boston, MA: Pearson Education.

Vogt, W. P., Gardner, D. C., & Haeffele, L. M. (2012). *When to use what research design.* New York, NY: The Guilford Press.

Wang, P. (2010). Chasing the hottest IT: Effects of information technology fashion on organizations. *MIS Quarterly, 34*(1), 63-85. Retrieved from http://www.misq.org

Wenger, E. (1999). *Communities of practice. Learning, meaning, and identity*. Cambridge, UK: University Press.

Wenger, E. (2011). *Communities of practice: A brief introduction*. Retrieved from https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/11736/A%20brief%20introduction%20to%20CoP.pdf?sequence=1

Winston, E. R., Medlin, B. D., & Romaniello, B. A. (2012). An e-patient's end-user community (EUCY): The value added of social network applications. *Computers in Human Behavior, 28*, 951-957. doi:10.1016/j.chb.2011.12.016

Wopereis, I. G. J. H., Sloep, P. B., & Poortman, S. H. (2010). University weblogs as instruments for reflection on action in teacher education. *Interactive Learning Environments, 18*(3), 245-261. doi:10.1080/10494820.2010.500530

Wong, K. T., Goh, P., & Rahmat, M. K. (2013). Understanding student teachers' behavioral intention to use technology: Technology Acceptance Model (TAM) validation and testing. *International Journal of Instruction*, *6*(1), 89-104. Retrieved from http://e-iji.net/

Wu, L., Ye, X., & Looi, C. K. (2015). Teachers' preflection in early stages of diffusion of an innovation. *Journal of Computers in Education*, *2*(1), 1-24. doi:10.1007/s40692-014-0022-x

Yang, S. H. (2009). Using blogs to enhance critical reflection and community of practice. *Educational Technology & Society, 12*(2), 11-21. Retrieved from http://www.ifets.info/

Yuen, S. C. Y., Yaoyuneyong, G., & Yuen, P. K. (2011). Perceptions, interest, and use: Teachers and web 2.0 tools in education. *International Journal of Technology in Teaching and Learning, 7*(2), 109-123. Retrieved from http://www.isetl.org/ijtlhe/

Zbiek, R. M., Martin, W. G., & Schielack, J. F. (2012). *Making it happen: A guide to interpreting and implementing Common Core State Standards for Mathematics.* Reston, VA: National Council of Teachers of Mathematics.

Zhou, M. (2016). Chinese university students' acceptance of MOOCs: A self-determination perspective. *Computers & Education*, *92*, 194-203. doi:10.1016/j.compedu.2015.10.012

Appendix A: The Project

Goals: The goal of this PD module is for the participant teachers to increase their social media use intention. The results of the study revealed performance expectancy, effort expectancy, and intrinsic motivation, specifically experienced competence, were predictive factors of social media use intention. Strand 4e of Danielson's (2013) Framework for Teaching, which is used in SSD for teacher evaluation, allows great flexibility for professional learning; participation in the PD module of my project study fully meets the requirements. The activities of the PD module build from receptive use of the informal vCoP, reading and commenting on blogs, to generative use, writing their own blog, while building confidence and focused on the CCSS content of their own math classrooms.

Learning Outcomes:

- Day One Workshop: *Performance Expectancy* - Teachers will be able to demonstrate reading and commenting on math blogs of the MTBoS community to find instructional strategies and activities for CCSS math content they are currently teaching.
- Day Two Workshop: *Effort Expectancy* – Teachers will be able to demonstrate using the MTBoS search engine and Twitter to quickly find content and connect with virtual colleagues.
- Day Three Workshop and Asynchronous Challenges: *Experienced Competence* – Teachers will be able to demonstrate success with creating and using their own

blog and Twitter feed to connect with the MTBoS community and improve their instruction.

Target Audience: The specific target audience is the middle school math teachers of SSD. Since the study participants were members of MTBoS English-speaking countries, the results of the study and the PD module will be posted on my reflective math teaching blog and will be available to all the members of the MTBoS community. Therefore, the PD module could be implemented by any member of MTBoS at his or her own school district to encourage teachers to improve their instruction by participating in blogging.

Components: The PD module consists of two major components, three one-day workshops and asynchronous virtual challenges.

The focus of the first workshop is the technology acceptance predictive factor of performance expectancy. The instructor will introduce teachers to the structure, MTBoS and show teachers how they can use the informal vCoP to locate resources and connect with virtual colleagues who are teaching the same CCSS standards using effective instructional strategies in their classrooms with similar populations. At the end of the day, the instructor will give participants two asynchronous digital challenges to try before the next one-day workshop. These challenges focus on trying out the content of the day within their own classrooms and making connections with virtual colleagues within the MTBoS. This introductory workshop and the follow-up virtual challenges will focus on the receptive uses of the informal vCoP, introducing teachers to reading and commenting on the blogs of reflective math teacher bloggers.

The focus of the second workshop is the technology acceptance predictive factor of effort expectancy. The instructor will introduce teachers to the MTBoS search engine and Twitter feed and show teachers how they can use the informal vCoP to make finding resources and instructional strategies appropriate for their classroom fast and easy. The day will begin with teachers sharing their work from the asynchronous challenges. Additionally, teachers will be given two more asynchronous digital challenges to try before the final one-day workshop focusing on trying out the content of the day within their own classrooms and deepening a connection with a virtual colleague within the MTBoS. This second workshop and the follow-up virtual challenges will again focus on the receptive uses and introduce generative uses of the informal vCoP, encouraging teachers to read and comment on one blog that closely matches their own classroom as well as establishing and using a Twitter account to follow developments within the MTBoS community.

The third workshop focuses on the intrinsic motivation predictive factor of experienced competence. Therefore, the workshop will be a short training on reflective writing followed by a work session where teachers create blogs of their own in the Word Press format and write their first blog posts describing themselves and their classrooms for the About pages in their blogs. The instructor will give the participants two final asynchronous digital challenges to try. The first challenge is writing a blog post linking to an activity they tried from another MTBoS member's blog and describing how they adapted the lesson to work in their own classroom. The second challenge is describing a day in their teaching life soliciting resources or advice or from the MTBoS community and tweeting a link to the post to @MTBoS. This third workshop and the follow-up virtual challenges will again focus on the receptive uses and introduce generative uses of the informal vCoP, encouraging teachers to read and comment on one blog that closely matches their own classroom as well as establishing and using a Twitter account to follow developments within the MTBoS community. As an optional extension to the PD module, teachers will be shown the website https://exploremtbos.wordpress.com/ at the first one-day workshop where they can complete a questionnaire and be matched with a virtual colleague mentor who can guide them throughout the process of getting to know the informal vCoP.

Timeline: Three one-day workshops are provided during the inservice days throughout the school year. The second component consists of asynchronous virtual challenges following each one-day workshop for teachers to practice the skills acquired during the workshop and make connections to virtual colleagues within the MTBoS community. A voluntary extension component consists of participation in the ongoing MTBoS mentor/mentee program where teachers can work throughout the school year with an active member of the MTBoS community who has volunteered to serve as a mentor. The timeline for this PD module is designed for one academic school year.

- The module begins with a one-day workshop delivered to the staff during the inservice days before the start of school.
- The second one-day workshop will be held on an October inservice day.
- The third one-day workshop will be held on a January inservice day prior to the start of the second semester.

Materials: The district hosting the PD module will provide the following materials:

- Classroom space with adult sized furniture appropriate for the teacher participants to sit in table groups of 4 to 6.
- Technology to display the instructor's Power Point presentations
- Wi-Fi connection accessible to the instructor and the teacher participants throughout the course of the three one-day workshops
- Sackenstein, S. (2015). *Blogging for Educators: Writing for Professional Learning*. Thousand Oaks, CA: Corwin. (1 per participant).

The district host will send an email to teacher participants one week prior to each of the workshop days listing the materials they will need to bring:

- School or personal laptop, digital or traditional note taking supplies
- Login codes for Internet and district provided Google Drive account
- Current or upcoming unit of study

The second and third workshop lists for teacher participants will also include

- Work samples and/or other evidence from asynchronous challenges.

The instructor will provide the following materials:

- PowerPoint presentations, handouts, and evaluation forms
- Chart paper, index cards, and markers
- Additional extension cords for charging teacher participants' laptops

Instructor Notes:

Day 1: What is MTBoS?

Overview: The workshop will introduce teachers to the structure of the *Mathtwitterblogosphere*, also known as MTBoS, an informal virtual community of practice of English-speaking math teachers on the Internet. Teachers will be shown how they can use MTBoS to locate resources and connect with virtual colleagues who are teaching the same CCSS standards using effective instructional strategies in their classrooms with similar populations. Additionally, participants will be given two asynchronous digital challenges to try before the next one-day workshop. These challenges focus on trying out the content of the day within their own classrooms and making connections with virtual colleagues within the MTBoS. This introductory workshop and the follow-up virtual challenges will focus on introducing teachers to reading and commenting on the blogs of reflective math teacher bloggers. As an optional extension to the PD module, teachers will be shown the website https://exploremtbos.wordpress.com/ at the first one-day workshop where they can complete a questionnaire and be matched with a virtual colleague mentor who can guide them throughout the process of getting to know the informal vCoP.

Daily Schedule:

Time	Topic
8:00 – 8:30	Welcome & Logistics
8:30 – 9:15	*Review of the Project Study*
9:15 – 10:15	*Introduction to Reflective Teacher Blogging*
10:15 – 10:45	Break and Technology Set-up
10:45 – 12:15	*Introduction to MTBoS*
12:15 – 1:15	Lunch
1:15 – 2:30	*"Meeting" a Virtual Colleague*
2:30 – 3:00	Closing Session & Reflection

Day 2: How can MTBoS help me?

Overview: The workshop begins with teachers sharing the student work and evidence from their classroom from the asynchronous challenges presented at the last workshop. The sessions on day two will introduce teachers to the MTBoS search engine and Twitter feed and show teachers how they can use the informal MTBoS to make finding resources and instructional strategies appropriate for their classroom fast and easy. Teachers will be given two more asynchronous digital challenges to try before the final one-day workshop focusing on trying out the content of the day within their own classrooms and deepening a connection with a virtual colleague within the MTBoS. This second workshop and the follow-up virtual challenges will again focus on the receptive uses and introduce generative uses of MTBoS, encouraging teachers to read and comment on one blog that closely matches their own classroom as well as establishing and using a Twitter account to follow developments within the MTBoS community.

Daily Schedule:

Time	Topic
8:00 – 8:30	Welcome & Logistics
8:30 – 9:15	*Teacher Share of Challenges*
9:15 – 10:15	*Fishing for Tech: The MTBoS Search Engine*
10:15 – 10:45	Break and Technology Set-up
10:45 – 12:15	*The T in MTBoS: Twitter, Seriously!*
12:15 – 1:15	Lunch
1:15 – 2:30	*Sense of Community: Growing your Group*
2:30 – 3:00	Closing Session & Reflection

Day 3: How can I be a part of MTBoS?

Overview: The workshop will be a short training on reflective writing followed by a work session where teachers create blogs of their own in the Word Press format and write their first blog posts describing themselves and their classrooms for the About pages in their blogs. Teachers will be given two final asynchronous digital challenges to try. The first challenge is writing a blog post linking to an activity they tried from another MTBoS member's blog and describing how they adapted the lesson to work in their own classroom. The second challenge is describing a day in their teaching life soliciting resources or advice or from the MTBoS community and tweeting a link to the post to

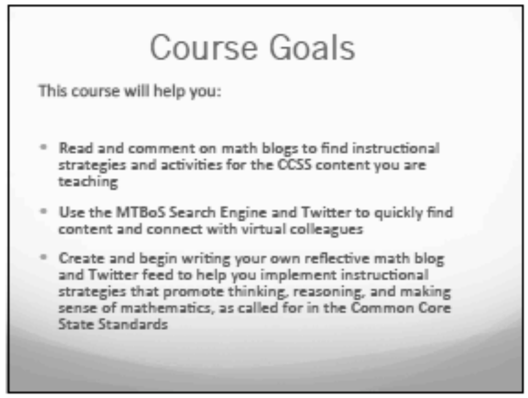
@MTBoS. This third workshop and the follow-up virtual challenges will again focus on the receptive uses and introduce generative uses of the informal vCoP, encouraging teachers to read and comment on one blog that closely matches their own classroom as well as establishing and using a Twitter account to follow developments within the MTBoS community.

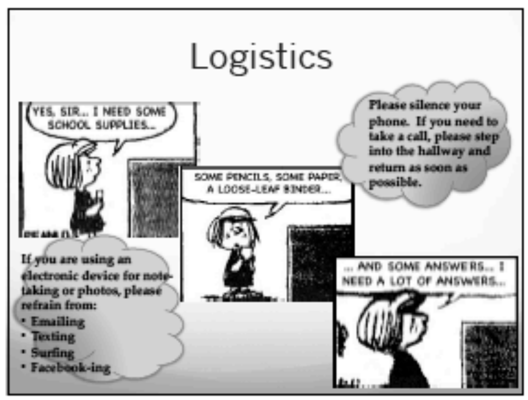
Daily Schedule:

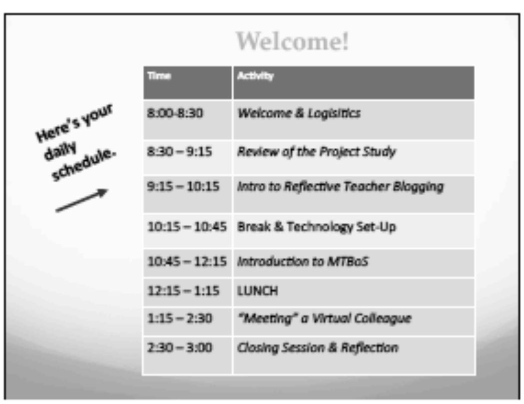
Time	Topic
8:00 – 8:30	Welcome & Logistics
8:30 – 9:15	*Teacher Share of Challenges*
9:15 – 10:15	*Introduction to Reflective Writing*
10:15 – 10:45	Break and Technology Set-up
10:45 – 12:15	*Introduction to Word Press*
12:15 – 1:15	Lunch
1:15 – 2:30	*Time to Write, Reflect, and Share*
2:30 – 3:00	Closing Session & Reflection

Power Points Day 1:

Welcome & Logistics

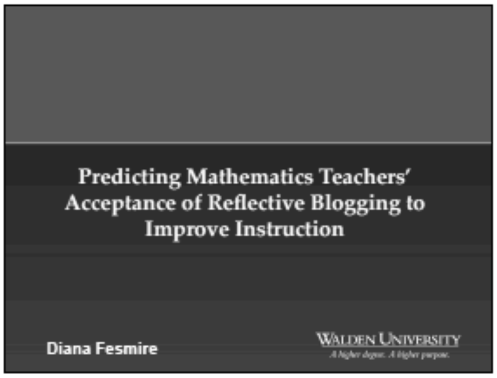


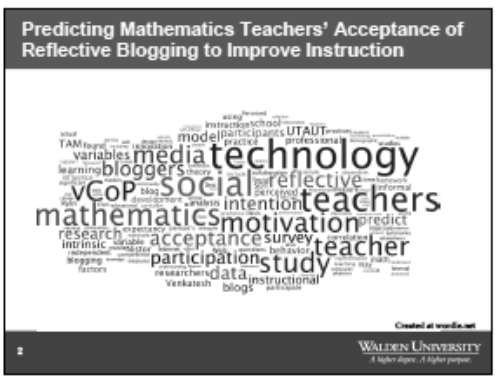


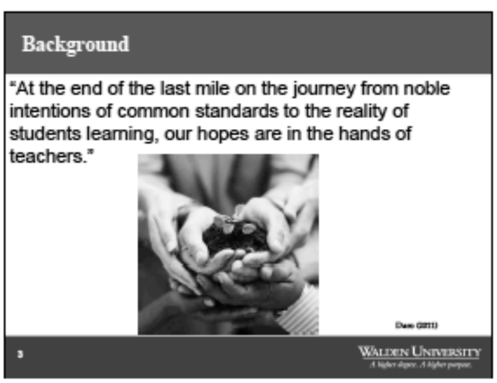


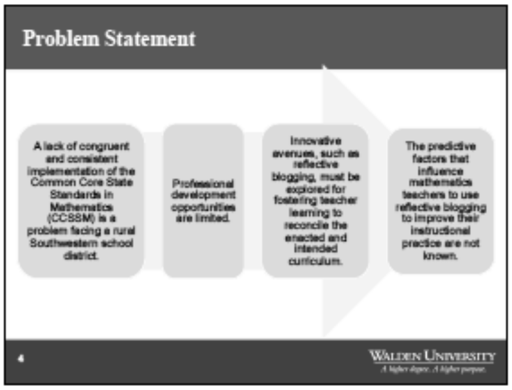
Time	Activity
8:00-8:30	*Welcome & Logisitics*
8:30 – 9:15	*Review of the Project Study*
9:15 – 10:15	*Intro to Reflective Teacher Blogging*
10:15 – 10:45	Break & Technology Set-Up
10:45 – 12:15	*Introduction to MTBoS*
12:15 – 1:15	LUNCH
1:15 – 2:30	*"Meeting" a Virtual Colleague*
2:30 – 3:00	*Closing Session & Reflection*

Review of the Project Study








Problem Statement
A lack of congruent and consistent implementation of the Common Core State Standards in Mathematics (CCSSM) is a problem facing a rural Southwestern school district.
Professional development opportunities are limited.
Innovative avenues, such as reflective blogging, must be explored for fostering teacher learning to reconcile the enacted and intended curriculum.
The predictive factors that influence mathematics teachers to use reflective blogging to improve their instructional practice are not known.
4
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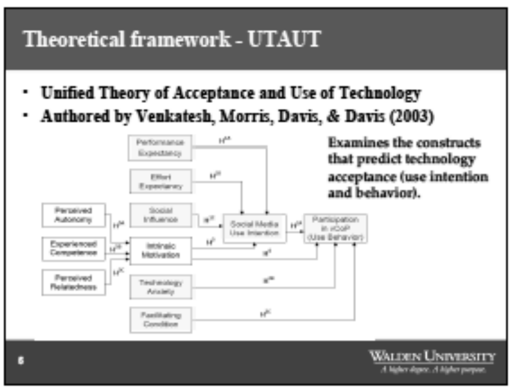
Theoretical framework - UTAUT
• Unified Theory of Acceptance and Use of Technology
• Authored by Venkatesh, Morris, Davis, & Davis (2003)
Examines the constructs that predict technology acceptance (use intention and behavior).
Performance Expectancy
Effort Expectancy
Social Influence
Perceived Autonomy
Experienced Competence
Perceived Relatedness
Intrinsic Motivation
Social Media Use Intention
Participation in vCoP (Use Behavior)
Technology Anxiety
Facilitating Condition
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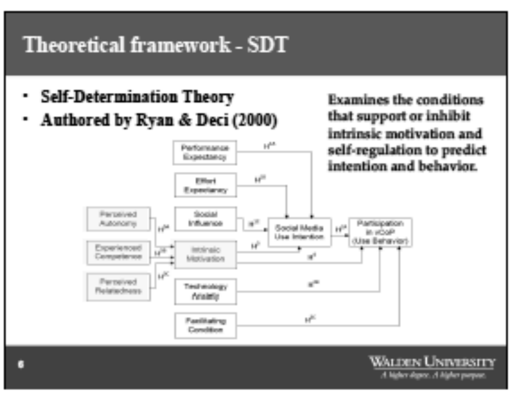
Theoretical framework - SDT
• Self-Determination Theory
• Authored by Ryan & Deci (2000)
Examines the conditions that support or inhibit intrinsic motivation and self-regulation to predict intention and behavior.
Performance Expectancy
Effort Expectancy
Social Influence
Perceived Autonomy
Experienced Competence
Perceived Relatedness
Intrinsic Motivation
Social Media Use Intention
Participation in vCoP (Use Behavior)
Technology Anxiety
Facilitating Condition
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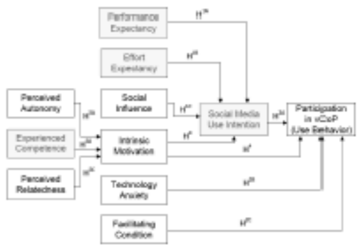
Research Study Findings



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Participants and sample size

- The population consists of English-speaking mathematics teachers who read, comment, and/or write reflective teaching blogs within informal vCoP on the Internet.
- The sample size was 104 math teacher blog authors, readers and commenters.
- Non-probability purposeful sampling using a snowball technique.

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References

- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Boston, MA: Pearson Education, Inc.
- Daro, P. (2011). Forward. In P. Sztajn, K. Marrongelle, P. Smith, & B. Melton (Eds). *Supporting implementation of the common core state standards for mathematics: Recommendations for professional development.* Retrieved from http://cadrek12.org/sites/default/files/CCSS%20Math.pdf
- Nistor, N., Trăușan-Matu, Ș., Dascălu, M., Duttweiler, H., Chiru, C., Baltes, B., & Smeaton, G. (2015). Finding student-centered open learning environments on the Internet: Automated dialogue assessment in academic virtual communities of practice. *Computers in Human Behavior, 47*, 119-127. http://dx.doi.org/10.1016/j.chb.2014.07.029
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. http://dx.doi.org/10.1037/0003-066x.55.1.68
- Sørebø, Ø., Halvari, H., Gulli, V. F., & Kristiansen, R. (2009). The role of self-determination theory in explaining teachers' motivation to continue to use e-learning technology. *Computers & Education, 53*(4), 1177-1187. http://dx.doi.org/10.1016/j.compedu.2009.06.001
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478. Retrieved from http://www.misq.org

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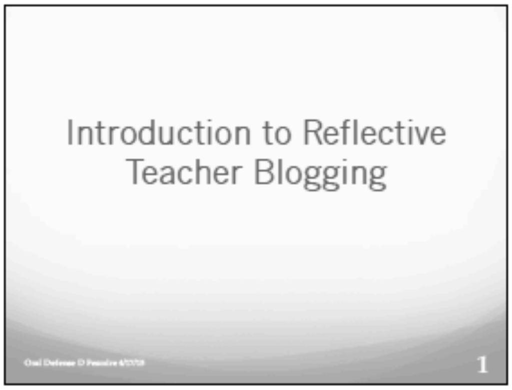
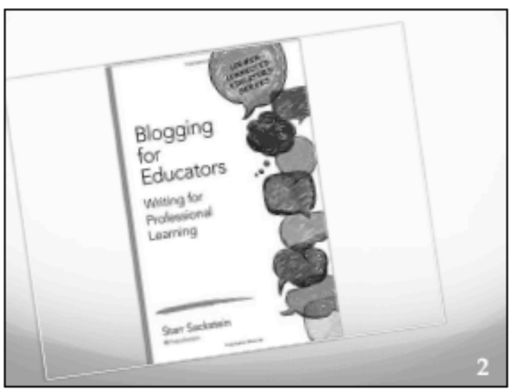
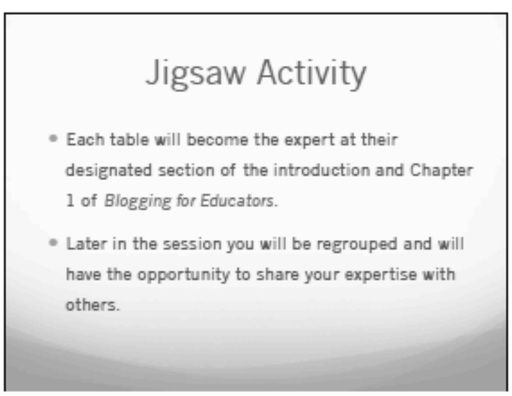
Introduction to Reflective Teacher Blogging







Blogging for Educators

1. Introduction & Why Blog (pages 1 – 4)
2. Started W Twitter & Blogging to Connect (5 – 8)
3. Tips to develop voice, Nothing to say (9 – 13)
4. Blogging for Resources & Reasons (14 – 16)

Jigsaw Part 2

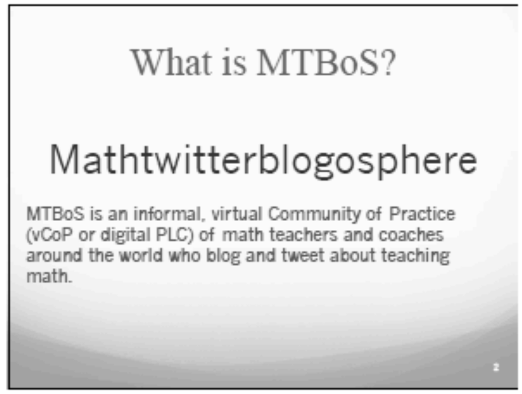
1. Number off each person in your group (1, 2, 3, or 4)
2. Regroup with like numbers (all the ones together, all the twos together, etc.)
3. Choose a poster from where you will start.
4. The creator of the poster shares its content.
5. Rotate and repeat.

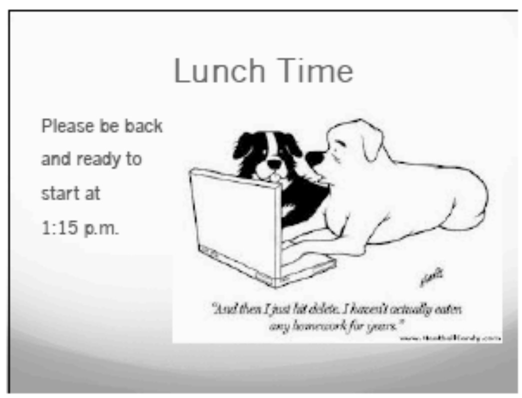
Reflection Questions

Choose one or two of the following questions:

- What scares you about blogging?
- What are you most passionate about? Can you put that passion into words?
- What is one thing you'd like to accomplish with a blog?
- What do you have to say to an audience?
- What is one story or experience you would like to share with readers?

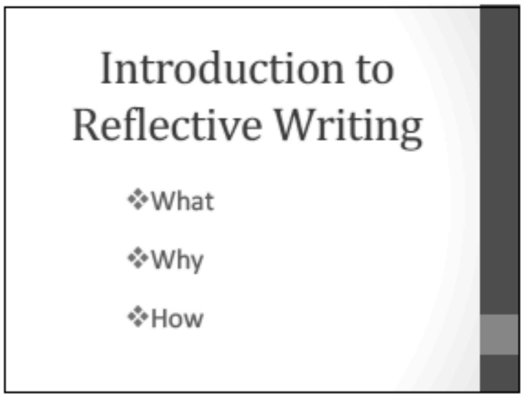
Introduction to MTBoS

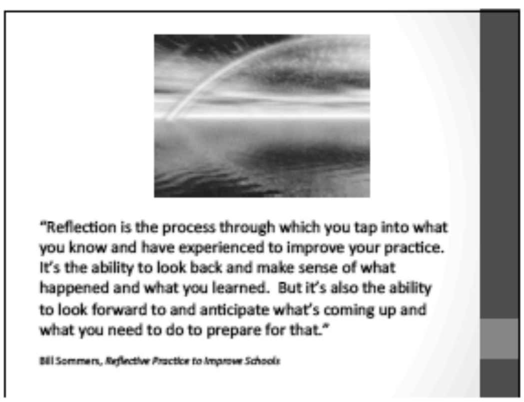


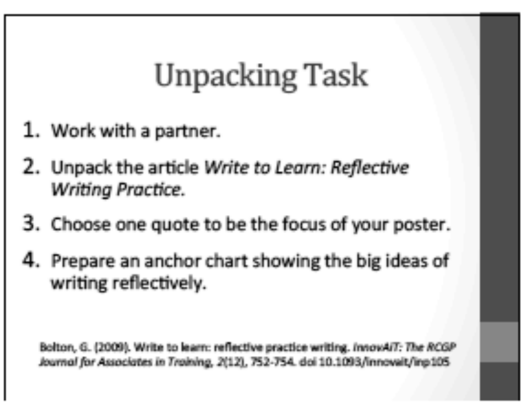


Power Points Day 3:

Introduction to Reflective Writing



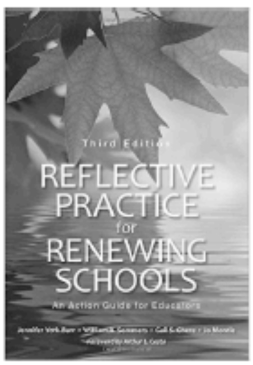




Gallery Walk

- Silently consider the work of other groups.
- What is similar to your work? What is different?
- What questions do you have for other groups?
- Are there changes or additions you would make to your poster?

Bolton, G. (2009). Write to learn: reflective practice writing. *InnovAiT: The RCGP Journal for Associates in Training, 2*(12), 752-754. doi 10.1093/innovait/inp105



Think about a lesson that occurred in your classroom that you feel is worth further reflection.

- Think on your own
- Talk with a partner
- Record your ideas

York-Barr, J., Sommers, W., Ghere, G., & Montie, J. (2016). Reflective Practice for Renewing Schools: An Action Guide for Educators. Thousand Oaks, CA: Corwin Publishing.

What happened? (Description)

- What did I do? What did other (students, adults) do?
- What was my affect at the time? What was their affect?
- What was going on around us? Where were we? When did it occur? Was there anything unusual happening?

York-Barr, J., Sommers, W., Chere, G., & Montie, J. (2016). Reflective Practice for Renewing Schools: An Action Guide for Educators. Thousand Oaks, CA: Corwin Publishing.

Why? (Analysis, interpretation)

- Why do I think things happened in this way?
- What was I thinking and feeling? How might this have affected my choice of behavior?
- How might the context or content have influenced the experience? Was there something about the activities? Something about the timing?
- Are there potential contributing factors? What are my hunches about why things happened the way they did?

York-Barr, J., Sommers, W., Chere, G., & Montie, J. (2016). Reflective Practice for Renewing Schools: An Action Guide for Educators. Thousand Oaks, CA: Corwin Publishing.

So What? (Overall meaning & application)

- Why did this seem like a significant lesson to reflect on?
- Why have I learned from this?
- How might his change my future thinking, practice, and interactions?
- What questions remain?

York-Barr, J., Sommers, W., Chere, G., & Montie, J. (2016). Reflective Practice for Renewing Schools: An Action Guide for Educators. Thousand Oaks, CA: Corwin Publishing.

Now What? (Implications for action)

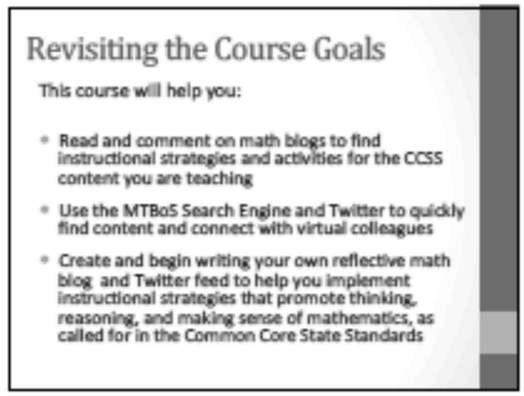
- Are there other people I should actively include in reflecting on this event? If so, who and what would we interact about?
- Next time I teach a similar lesson, what do I want to remember to think about?
- How could I set up conditions to increase the likelihood of productive interactions and learning?

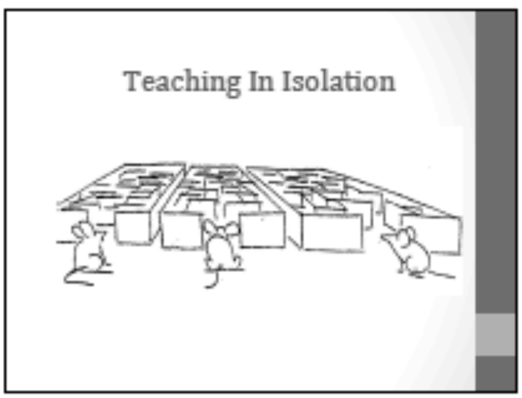
York-Barr, J., Sommers, W., Ghere, G., & Montie, J. (2016). Reflective Practice for Renewing Schools: An Action Guide for Educators. Thousand Oaks, CA: Corwin Publishing.

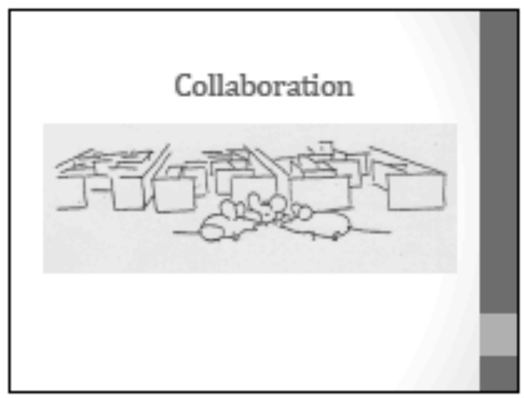
3-2-1 Reflection

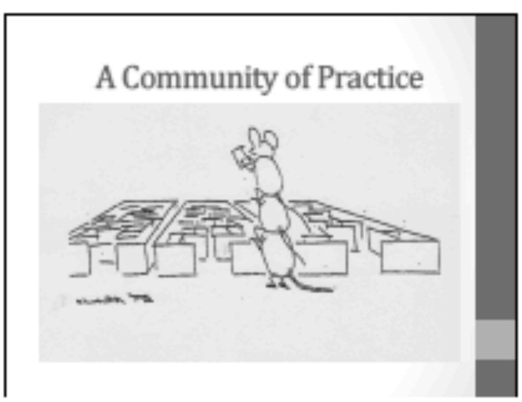
- 3 a-ha moments
- 2 things you want to be sure to remember about reflective writing
- 1 question you still have about reflective writing

Closing Session & Reflection









SSD Professional Development Feedback Form

1. What is your name?

2. What school site do you work at?

☐ (List of school sites)

3. Please provide feedback using this scale when 4 is the highest score:

	1 (Not at All)	2 (Very Little)	3 (Somewhat)	4 (Mostly or Completely)
This training supported alignment with the district's goals for student performance.		○	○	○
I felt our PLC (Professional Learning Community) norms were observed and followed.	○	○	○	○
Today's objectives were identified and followed.	○	○	○	○
The content was organized and easy to follow.	○	○	○	○
I will be able to apply the knowledge learned.	○	○	○	○
This PLC/Training increased my confidence about today's topic (s).	○	○	○	○

4. What 3 things were important to me in my learning?

5. What are 2 things that still have me curious or confused?

6. What is one new thing I am willing to try before "we" meet again?

7. What did I do to enhance my own learning today, and what could have been done differently to improve my learning experience?

8. Additional thoughts...

Appendix B: Permission to Use Figures, Tables, and Surveys

Figure 1. Original TAM model (Turner et al., 2010)

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Portion	figures/tables/illustrations
Number of figures/tables/illustrations	1
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Figure 2. TAM 3 Model (Faqih, Riad & Jaradat, 2015).

SDT Survey (Sørebø, Halvari, Gulli, & Kristiansen, 2009).

From: **Ø Sørebø** <Oystein.Sorebo@hbv.no>
to: Diana Fesmire <diana.fesmire@waldenu.edu>
date: Sun, Mar 1, 2015 at 4:58 AM
subject: RE: Permission to use SDT survey instrument

Dear Diana,
It is in our interest that others use our survey instruments. Please be free to use our instruments in connection with your PhD research.
Best regards,
Oystein (& coauthors)
Med vennlig hilsen / Best regards,
Ø Sørebø

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Figure 3. UTAUT model and UTAUT survey

from: V Venkatesh <vvenkatesh@vvenkatesh.us>
to: Diana Fesmire <diana.fesmire@waldenu.edu>
date: Fri, Mar 13, 2015 at 1:30 PM
subject: RE: Permission to use UTAUT in doctoral research

Thanks for your interest. I am sorry for the delayed response which is due to a hectic travel schedule.

You have my permission. You will find related papers at:
http://vvenkatesh.com/Downloads/Papers/fulltext/downloadpapers.htm

You may also find my book (that can be purchased for a significant student discount and faculty member discount) to be of use: http://vvenkatesh.com/book

Hope this helps.
Sincerely,
V Venkatesh

From: Diana Fesmire [mailto:diana.fesmire@waldenu.edu]
Sent: Saturday, February 28, 2015 1:00 PM
To: vvenkatesh@vvenkatesh.us
Subject: Permission to use UTAUT in doctoral research

Dr. Venkatesh,
I am a doctoral student at Walden University. I am requesting permission to use the UTAUT model and survey instrument in my dissertation entitled Virtual Communities of Practice: Engaging Teachers in Blogging to Improve Instructional Practice. My target date for graduation and publication is January 2016.

Thank you for your consideration of my request.

Sincerely,

Diana Fesmire

MIS Quarterly
Carlson School of Management
University of Minnesota
Suite 4-339 CSOM
321 19th Avenue South
Minneapolis, MN 55455

March 3, 2015

Diana Fesmire
[redacted]

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Date: 2015.03.03 09:45:36 -06'00'

Janice I. DeGross
Manager

Appendix C: Survey

Demographic Questions

6. My answers to the following questions will refer to the following mathematics teaching blog:

7. The nickname I use to comment on this blog is:

8. My gender :

    1. Male
    2. Female
    3. Other

9. My country of residence:

10. I have been actively blogging for . . .

    1. Less than 2 years
    2. 2 to 3 years
    3. 4 to 5 years
    4. 6 to 7 years
    5. More than 7 years

11. This is how I would describe my experience with mathematics teaching blogs:

    1. Inexperienced
    2. Beginner
    3. Intermediate
    4. Advanced

UTAUT Technology Acceptance Survey Questions

12. Performance expectancy	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
I find this blog platform useful for exchanging ideas in the blog community.							
Using the blog platform enables me to exchange ideas more quickly.							
Using this blog platform increases my productivity in exchanging ideas.							
If I use this blog platform it will increase my chances of recognition in the blog community							
13. Effort expectancy	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
My interaction with this blog platform is clear and understandable.							
It is easy for me to become skillful at using this blog platform.							
I find this blog platform easy to use.							
Learning to operate this blog platform is easy for me.							
14. Social influence	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
People who are important to me think that I should use this blog platform.							
People who are important to me have been helpful in the use of this blog platform.							
People who are important to me have supported the use of this blog platform.							

15. Facilitating conditions	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
I have the necessary resources to use this blog platform.							
I have the knowledge necessary to use this blog platform.							
This blog platform is not compatible with other Internet tools I use.							
A specific person (or group) is available for assistance with difficulties when I use this blog platform.							
16. Technology anxiety	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
I feel apprehensive about using this blog platform.							
When using this blog platform, it scares me to think that I could use a lot of information by hitting the wrong key.							
I hesitate to use this blog platform for fear of making mistakes I cannot correct.							
This blog platform is somewhat intimidating to me.							
17. Use Intention	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
I intend to use this blog platform in the next few months.							
I predict I will use this blog platform in the next few months.							
I plan to use this blog platform in the next few months.							

SDT Motivation Survey Questions

18. On this blog platform . . .	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
. . . I can decide which activities I want to practice.							
. . . I feel that I participate in blogging activities because I want to.							
. . . I have to force myself to do the blogging activities.							
. . . I feel a certain freedom of action.							
. . . I have some choice in what I want to do							
19. Experienced competence	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
I think I am pretty good at blogging							
I am satisfied with my performance at blogging.							
When I have participated in blogging activities for a while, I feel pretty competent.							
I am pretty skilled at blogging.							
I cannot do blogging activities very well.							
20. With the other users of this blog platform, I feel . . .	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
. . . supported.							
. . . understood.							
. . . listened to.							
. . . valued.							
. . . safe.							

21. I use this blogging platform because . . .	Strongly Disagree	Disagree	Somewhat Disagree	Neither agree or disagree	Somewhat Agree	Agree	Strongly Agree
. . . blogging is fun.							
. . . I enjoy exchanging ideas.							
. . . blogging is exciting.							
. . . of the enjoyment that I feel when exchanging ideas.							