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Effects of Training on Intent, Ease, Self-Efficacy, Frequency, and Usefulness in Multimedia-Based Feedback for University-Level Instructors Using Canvas® LMS

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EFFECTS OF TRAINING ON INTENT, EASE, SELF-EFFICACY, FREQUENCY, AND USEFULNESS IN MULTIMEDIA-BASED FEEDBACK FOR UNIVERSITY-LEVEL INSTRUCTORS USING CANVAS® LMS

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This dissertation, written under the direction of the candidate's dissertation committee and approved by the members of the committee, has been presented to and accepted by the Faculty of the School of Education in partial fulfillment of the requirements for the degree of Doctor of Education. The content and research methodologies presented in this work represent the work of the candidate alone.

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ABSTRACT

The purpose of this study was to investigate how training and professional development effected university-level instructors' perceived usefulness, perceived ease of use, behavioral intent to use, perception of self-efficacy, and frequency of use of audio-, video-, and speech-to-text-recognition-based technologies associated with the feedback and assessment process in college-level teaching. Except for usefulness, each dependent variable was divided into two based on whether the item was multimedia or not: (a) use of technology with multimedia and (b) use of technology without multimedia. The convenience sample included 52 university-level instructors who had enrolled in either the Canvas® Essentials (a basics course) or Canvas® Feedback and Assessment (an advanced course) training. The advanced training focused on how to use audio, video, and speech-to-text-recognition features of the learning management system to provide feedback to students.

The study commenced in August of 2015 and concluded in April of 2016. A pretest questionnaire was administered prior to each Canvas® training class, and instruction began immediately thereafter lasting 2 hours per class session. The posttest was administered 4 weeks after the training class. Twenty-six instructors represented the treatment group, and 26 represented the comparison group.

Means measuring intent, self-efficacy, and usefulness indicated either agreement or strong agreement for both treatment and comparison groups; however, the variables of intent and usefulness resulted in little-to-no change in means from pretest to posttest. For the variable of self-efficacy, both groups' means increased from pretest to posttest. Higher means indicated stronger agreement with the construct.

The variable of self-efficacy also resulted in a statistically significant change from pretest to posttest for both groups. Treatment-group participants' mean went up .41 of a point from pretest to posttest and had a strong effect (ES = .86), indicating that they were somewhat skilled at posttest. The comparison-group means also reflected increased agreement in self-efficacy, participants on average reported that they were between not very skilled and somewhat skilled at using Canvas® LMS at pretest. At posttest, the comparison group's mean indicated that they were above the somewhat skilled choice on the rating scale.

For both groups, the mean measuring the construct of intent (media) decreased slightly from pretest to posttest, and the results were not statistically significant. Means for ease were higher at posttest for both groups; the independent-samples *t* test resulted in statistical significance for the comparison group with a moderately strong effect size. The variables of ease (media) and frequency resulted in higher means at posttest for both groups and were statistically significant across four paired-samples *t* tests. Moderately strong effect sizes were present in the variables of ease and frequency among comparison-group participants. The variables of self-efficacy (media) and frequency (media) resulted in means that signified the lowest levels of agreement among the nine dependent variables. For treatment-group participants, self-efficacy (media) resulted in a large statistically significant effect, and mean increased from pretest to posttest.

Self-efficacy (media) for comparison-group participants increased in agreement from pretest to posttest, and the results were statistically significant with a large effect. Frequency (media) decreased in agreement from pretest to posttest for treatment-group participants, and comparison-group participants' mean increased slightly from pretest to

posttest. No independent-samples *t* tests resulted in statistically significant findings for the variable of frequency (media).

This research addressed a gap in the literature and illustrated that instructors are willing participate in research. The study participants gained new skills to support their own day-to-day work teaching courses and grading assignments, which was a benefit to them, the university, and the research community.

Signature Page

DEDICATION

This body of work is dedicated to the underserved, to those without access to quality education. With this dedication I vow to serve my community, to be compassionate, to be productive, and to pay the good fortune forward by helping people socially, educationally, and in any way that I may make a positive difference.

ACKNOWLEDGEMENTS

This dissertation illustrates my lifelong commitment to instruction, learning, Education, and the discipline of instructional design. By completing the degree of Doctor of Education degree I am now poised to make highly significant and relevant contributions within the field of Education and adult learning. I could not have completed this Educational program and dissertation without the generous guidance, assistance, and motivational support from many individuals. I thank you each for your partnership, collaboration, and generous thoughts. Specifically, I thank the following:

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CHAPTER I

INTRODUCTION TO THE STUDY

In 2010, Allen and Seaman partnered with the Babson Questionnaire Research Group and the Sloan Consortium and found that more than 5.6 million students had taken at least one online course in 2009, representing an increase of one million students from the previous year. Working in conjunction with the Alfred P. Sloan Foundation, the Babson group found that the growth rate for online university enrollments was 21% per year, contrasted with an overall university growth rate of under 2% annually. The increased prevalence of online teaching and learning is one example illustrating the rise in the comfort with and dependence on technology among university students in the United States. As such, educators in an increasingly digitized educational paradigm need to provide students with learning experiences that use technology to either deliver content or assess students' learning (Gabriel, Campbell, Wiebe, MacDonald, & McAuley, 2012).

The learning management system (LMS) is an technology-based electronic tool commonly used by higher education institutions to deliver, manage, and track online learning, as well as to facilitate communication and collaboration between instructors and students (Lonn & Teasley, 2009; Motaghian, Hassanzadeh, & Moghadam, 2013; Wang & Wang, 2009) and also is used by 9 out of 10 universities in the United States (Little-Wiles, Hundley, Worley, & Bauer, 2012; Lonn & Teasley, 2009; Smith, Salaway, & Caruso, 2009). From the early 2000s to 2015, nearly 95% of all instructors use a LMS for tasks such as grading, posting documents, and general communication, including email (Little-Wiles et al., 2012; Woods, Baker, & Hopper, 2004).

Researchers have suggested recently, however, that LMS usage for delivery of richer multimedia-based communication, assessment, and interactivity is lacking (Little-Wiles et al., 2012; Schoonenboom, 2014). When asked how the experience of using LMS could be improved, instructors stated the need for additional "specialized training over certain features" (Little-Wiles et al., 2012, p. 9). Other areas in which respondents desired additional training included bulk upload of files to the LMS and increased compatibility with other email and communication accounts. Reasons faculty reported reluctance to use an LMS were technical unreliability, slow system response time, and a general lack of training (Little-Wiles et al., 2012).

Researchers have begun to examine more closely LMS usage by instructors. Schoonenboom (2014) studied why instructors intended to use some LMS functionalities more than other ones by measuring their perceptions of task importance, task performance, perceived LMS usefulness, perceived LMS ease of use, and behavioral intention to use the LMS for 18 different instructional tasks. The results suggested that low intention to use LMS can be explained by (a) low task importance or performance, (b) low LMS usefulness, and (c) low LMS ease of use.

A 2007 meta-analysis entitled The Power of Feedback synthesized over 500 meta-analyses that encompassed almost one-half of one million effect sizes from 180,000 studies related to influences on student achievement. A subset of this meta-analysis focused specifically on feedback types included a review of 74 meta-analyses that encompassed over 7,000 studies and over 13,000 effect sizes and found that the most effective forms of feedback "provide cues or reinforcement to learners, are in the form of video, audio, or computer-assisted instructional feedback, and relate to goals" (Hattie &

Timperley, 2007, p. 84). An effect size of .95 was reported for feedback in general, and specifically for video or audio feedback, an effect size of .64 was reported (Hattie & Timperley, 2007).

In 2008, Malikowski researched how and why instructors use multiple LMS features and found that nearly half of the instructors use almost none of the features available to them. Future directions presented in the study suggested that little is known regarding what combination of LMS features constitute an effective approach in meeting a learning-related goal (Malikowski, 2008). Another 2008 study assessed instructors' awareness of the benefits and adoption of a web-based learning system (similar to LMS) and how the system could supplement in-class learning found that few instructors chose to use the system even though some who reported that the system could improve student outcomes and interaction with their instructors (Ajjan & Hartshorne, 2008). The researcher acknowledged that the study did not analyze if there were support mechanisms in place for instructors to consult, that the instructors did not participate in training or professional development that focused on technology use, and that future research might address these elements associated with technology integration (Ajjan & Hartshorne, 2008).

More recently, a 2013 study used an animated agent and intended to investigate varying types of feedback and their effect on learning outcomes, student motivation, and cognitive load in a multimedia-learning environment used to teach science. The results suggested that participants who received elaborate feedback through an animated agent realized outcomes of increased statistical significance over those provided with simple feedback (Lin, Atkinson, Christopherson, Joseph, & Harrison, 2013). The researchers suggested additional research focusing on feedback modality (text versus audio were highlighted) because the type of feedback provided may have an effect on learning outcomes, motivation, and cognitive load (Lin et al., 2013).

A 2014 study focused on a multimedia-based teaching intervention coupled video with an audio podcast and used preservice teachers as participants. Results suggested that instructors who watched video and also listened to an audio recording used more evidence-based teaching practices than those in the comparison group (Ely, Kennedy, Pullen, Williams, & Hirsch, 2014). The researchers suggested that future research should measure features that support instructor cognition, learning, and practice to validate improvements when integrated with multimedia (Ely et al., 2014).

A search of empirical literature revealed a multitude of research focusing on instructors' attitudes toward adoption of new technologies (Aldunate & Nussbaum, 2013; Ashrafzadeh & Sayadian, 2015; Motaghian et al., 2013; Schoonenboom, 2014; Wang & Wang, 2009; West, Waddoups, & Graham, 2007). Also abundant in the literature were studies that detail students' views and perceptions of feedback in the learning process (Kashif, ur Rehman, Mustafa, & Basharat, 2014; Salaber, 2014; Saunders, 2014). The literature lacked studies that extend understanding of college instructors' attitudes and skill levels in providing feedback using multimedia, and specifically no study was located that targeted the relatively new audio- or video-based-feedback functionalities contained within Canvas® LMS. This lack of knowledge was problematic because implementation of new information systems is expensive and typically is unsuccessful (Legris, Ingham, & Collerette, 2003). With costs ranging from $60,000 to millions of dollars to evaluate, design, and implement LMS (Black, Beck, Dawson, Jinks, & DiPietro, 2007), ensuring that instructors perceive the tools as valuable may be the first step in making sure instructors use them. Thus, better understanding of instructors' preferences may help university leadership make decisions that lead to increased LMS adoption and use by instructors. Increased adoption will ensure that instructors are meeting the preferences and expectations of today's students that include increased use of technology in the teaching and learning process and reduced reliance on traditional teaching methods (Vincelette & Bostic, 2013).

Twenty-six of 31 students participating in a research study reported that they preferred audio when compared with text-based feedback and were found to be five-to-six times more likely to apply higher levels of Bloom's taxonomy including analysis, synthesis, and evaluation when provided with audio feedback as opposed to feedback that was textbased (Ice, Swan, Diaz, Kupczynski, & Swan-Dagen, 2010). Research also has suggested that instructors have perceived pressure from their students to use LMS in their teaching practices (West et al., 2007). A 2013 study evaluated both student and instructors' perceptions of a screen capturing technology that allowed for the instructor to create a multimedia recording of their computer screen and then annotate it with audio messaging. The study reported that students prefer multimedia-oriented feedback because traditional feedback is difficult to decipher due to instructors' handwritten comments, inadequate levels of specificity, and too much variation from course to course (Vincelette & Bostic, 2013). Additional studies found that students desire multisensory feedback and that they perceive this type of feedback as flexible and effective when compared with traditional feedback methods that typically are characterized as handwritten comments (Ice et al., 2010; Silva, Correia, & Pardo-Ballester, 2010; Vincelette & Bostic, 2013).

A comprehensive review of the literature suggested that progress had been made in the areas of multimedia use and adoption by instructors and in instructor training and professional development; however, new research focusing specifically on the use of LMS tools including multimedia-oriented ones and how training and professional development increases instructor use of the tools has been welcomed by the research community.

Purpose of the Study

The study aimed to generate new knowledge by researching how training and professional development (the independent variable) affected instructors' intent, ease, self-efficacy, frequency, and perceived usefulness of use of audio- or video-based technologies in the feedback and assessment process.

The practice of implementing new technologies within schools and universities without training and ongoing support has failed and has often led to a lack of adoption and use (Aldunate & Nussbaum, 2013; Ashrafzadeh & Sayadian, 2015; Motaghian et al., 2013; Schoonenboom, 2014; Wang & Wang, 2009; West et al., 2007). This practice has been characterized as instructors being "thrown into a new environment" (Regan et al., 2012, p. 204). The approach of introducing instructors to new technological environments without training had resulted in a lack of knowledge and proficiency to use new technologies effectively (Aldunate & Nussbaum, 2013; Ashrafzadeh & Sayadian, 2015), the intent of the present study was to provide training to reduce that gap in knowledge and proficiency and increase usage among instructors. Also, student expectations include the incorporation of multimedia-based feedback in the teaching process and research has suggested that students respond positively to audio-based feedback (Davis & McGrail, 2009; Ice, Swan, Diaz, Kupczynski, & Swan-Dagen, 2010; Silva et al., 2010).

The dependent variables were measured using a questionnaire intended to establish baseline data prior to training and make inferences using statistical tests to identify any statistically significant changes in viewpoint and behavior between treatment and comparison instructors at the university. All treatment-group members participated in a newly developed training course on how to use multimedia-oriented LMS functionalities, including audio- or video-based feedback and a speech-to-text-recognition-feature within the Canvas® LMS. A comparison group was asked to complete the same battery of tests that the treatment group completed and consisted of participants of a currently offered training course administrated at the same university. The comparison group did not receive the new treatment that was considered an advanced training course and instead completed a Canvas® training course on basic Canvas® functions including initial course setup and how to post a syllabus.

Background and Need

Information in this section provides the need for the study through a review of key empirical evidence and also provides a contextual background of the problem that was researched, first by presenting information on the need to investigate the topic of faculty development and multimedia use in the feedback and assessment process and second to establish a context related to the variables associated with the study.

The need to better understand university-level instructors' attitudes and skill levels in the provision of feedback to students using multimedia was and continues to be evident in the literature. Learning management systems were used by 9 out of 10 universities in the United States (Little-Wiles et al., 2012; Lonn & Teasley, 2009; Smith et al., 2009), and the extent of functionalities contained within the LMS continues to increase as systems are upgraded and improved. An example includes the Canvas® LMS that was used for the study; at the beginning of 2013, the Canvas® LMS company added audio- or video-based communication tools to Canvas® Speedgrader® that provided an alternative to traditional text-based or face-to-face-oriented feedback and provided a more personal and human experience to students due to the inclusion of audio- or video-based messaging. Coupled with the fact that feedback and assessment is a critical step in the teaching and learning process, multimedia feedback can help to bridge the gap between student and instructor, establish rapport between the two, and guide students as they develop themselves resulting in better performance in their professional lives (Kashif et al., 2014).

Instructors' perceptions, feelings, and intentions to use multimedia in the feedback and assessment process defined the purpose of the study; the need to further research these elements are presented along with the perceptions of students (students were not included as participants but their expectations did contribute to the need for the study).

Feedback is one of the most important parts of teaching and learning (Hattie & Timperley, 2007) and is regarded as crucial and powerful in improving knowledge and skill in educational situations (De Villiers, 2013). Even though research on the topic of feedback dates back to the 1920s (Arps, 1920), the need to better understand instructors' perceptions of usefulness and intentions to use multimedia in the feedback and assessment process still exists due to the changing paradigm of technology that has provided new ways for instructors to connect with their students when providing feedback. Research has suggested that handwritten feedback is not ideal and that the ideal type of feedback is difficult to agree on (Krause, Stark, & Mandl, 2009). Although grades are important to students, a deeper way to connect with the content was preferred and appreciated (Silva, 2012).

Ajjan and Hartshorne's (2008) study intended to assess instructors' awareness of the Web 2.0 technology platform. Web 2.0 was characterized as a technology that extended web-related resources for instructors with a platform that allowed for further enhancements within the teaching and learning environment knowledge through online social interactions. The study attempted to answer two research questions: (a) how aware are university instructors regarding the benefits of Web 2.0 when used as a supplement to in-class instruction and (b) what factors effectively predict instructor's decisions to use Web 2.0 as a classroom supplement.

The quantitative study was open to instructors of all levels and classifications (full-time, part-time) and had 136 participants in total. Forty percent of the participants were male, and 60% were female; the distribution of ages ranged from under 30 to over 60. The questionnaire instrument used to collect data was derived from a theoretical framework entitled the decomposed theory of planned behavior that postulating behavior is a distinct function of behavioral intention and behavioral intention is a function of attitude. Based on the theory, a questionnaire was adopted from previous studies intended to help the researchers investigate instructor's comfort levels with the new Web 2.0 technology and was comprised of 35 Likert-type items. Constructs that guided the item development included actual usage and behavior, behavioral intention, attitude, ease of use, perceived usefulness, subjective norms, perceived behavioral control, peer influence, superior influence, student influence, compatibility, facilitating conditions, and self-efficacy (Ajjan & Hartshorne, 2008). The present study used several of the same constructs contained within the Ajjan and Hartshorne (2008) study including perceived usefulness, perceived ease of use, behavioral intent to use, perception of self-efficacy, and frequency of use of audio- or video-based technologies, and the present study extended the research by linking the constructs with the feedback and assessment process within the overall teaching and learning process.

Cronbach coefficient alpha was obtained for all groups of items. The questionnaire was pilot tested that resulted in minor rewording of items and sequencing. A path analysis was used as the statistical procedure for analysis in an attempt to identify effects and linkages between constructs.

The results of question number one were associated with instructors' awareness of the benefits of Web 2.0 and suggested that many instructors acknowledged the pedagogical benefits of the application. Blogs were seen as most useful in promoting interactions between students, and faculty and social networks were perceived as useful in building student-to-student interactions. When compared with actual use by instructors, however, perception of usefulness did not exactly predict actual use. The second research question examined which of the factors best predicted actual adoption among instructors and found that attitudes and perceived behavioral control had strong positive influence on behavioral intention to use the system. Subjective norm did not influence behavioral intention to use. The Ajjan and Hartshorne (2008) study did not include training and professional development as a variable, which constitutes a gap in the research. If training was used as a treatment, it is possible that research question number one may have had a different and statistically significant effect on participants' increased use of the system. The present study extended that research by using a two-group design that will allow for comparisons to be made between groups. Using training as the treatment helped to illustrate if training makes a difference in instructors' behavioral intentions to use the tools available to them.

Electronic searches of databases including ERIC, Google Scholar, EBSCOHost, Fusion, ProQuest, and ScienceDirect returned literature in the areas of LMS use among teachers and university instructors, feedback and assessment using multimedia, and technology training for instructors, which is the focus of the study. Search terms included *technological assessment, technology adoption instructor, learning management system use instructor,* and *technology training instructor*. Although these searches returned large amounts of relevant literature, few results specifically were related to the use of audio or video through the LMS for feedback purposes.

Many researchers have investigated if instructors will accept and use new technological offerings available to them. These studies generally appear in empirically reviewed journals geared toward computer use, such as *Computers & Education, Computers in Human Behavior,* and *Internet and Higher Education*. Past published studies were primarily either summaries of previous studies, position papers, literature reviews, or studies that were not designed with pre- and posttest measures (Ajjan &

Hartshorne, 2008; Aldunate & Nussbaum, 2013; Larsen, Sørebø, & Sørebø, 2009; Motaghian et al., 2013; Schoonenboom, 2014; Wang & Wang, 2009). Most articles were published recently, although some dated back to 2008. The present study intended to provide additional empirical research to the existing body of literature that focused on LMS use among instructors, use of technology, and multimedia when providing feedback to students, and whether basic or advanced training increased instructors' perceptions of usefulness and ease of use of multimedia, behavioral intentions to use multimedia, perception of self-efficacy to use technology, and frequency of use of audio- or video-based and voice-to-speech-recognition technologies in the feedback and assessment process.

Theoretical Framework

The technology acceptance model (TAM) and derivatives of some of the original scales used with the TAM provided the theoretical framework used in the research study. The TAM had not been used in the context of instructor adoption of LMS technologies as much as it has been used in commercial industry; however, it did provide a useful, logical, and relevant framework to assess instructors' behavioral intent to use technology tools that were new to them. This section provides details of the constructs contained within the TAM, the history of the TAM, and the constructs that were used to generate research questions that were used in the study.

Since 1995 (Chuttur, 2009), adoption of technology has been described as one of the most discussed topics associated with information-systems research (Venkatesh, 2006), and research results have suggested repeatedly that the TAM is one of the strongest models available to help explain end-user technology adoption at the individual level (Wu, Zhao, Zhu, Tan, & Zheng, 2011). In 1985, with several revisions over time, doctoral student Fred Davis conceptualized the TAM as part of his dissertation at the Massachusetts Institute of Technology. Prior to developing the first iteration of the TAM, Davis used the stimulus, organism, and response model as a conceptual framework to describe the motivational processes that connect the characteristics of a system to the behavior of an end user of a computer system. Davis (1985) then suggested that the features and capabilities of the system are controlled by the system designers, developers, and their colleagues, and those systems need to be designed in a way that motivates end users to use adopt them. As potential users evaluate the features of the system their motivation training may help to prevent abandonment of new technology-based tools that could be of use in the teaching, grading, and assessment processes. For these reasons, the following model was used to develop the TAM.

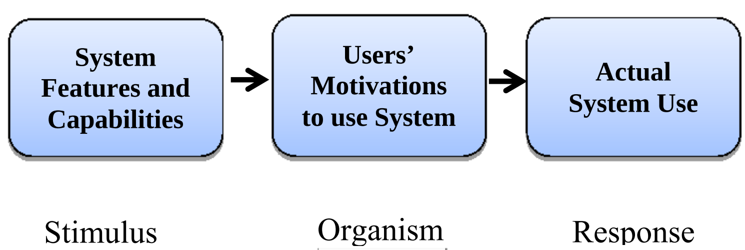

Figure 1. Conceptual framework for TAM adapted from Davis (1985).

The present study used the original TAM as a basis for its theoretical framework with some adoptions incorporated to it. The Xs in the model below (Figure 2) represent design features such as the color of the system interface, the location of the buttons on the screen, comfort when using devices such as a mouse, the or the location of the controls that the end user must press to execute functions in the system. Also, the original TAM is depicted in Figure 2.

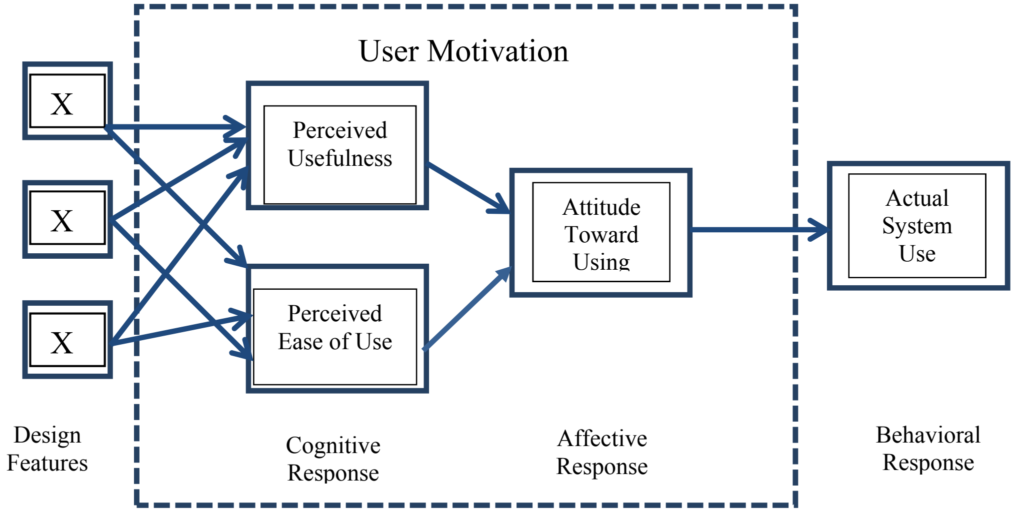

Figure 2. Original Technology Acceptance Model adapted from Davis (1985).

TAM: Modified for the Present Study

The TAM depicted below is the framework that was used for the study and was slightly modified by the researcher. To better reflect the constructs associated with the present study, attitude to use was removed from the model and perception of self-efficacy was added to the model. Constructs were then divided into either multimedia or non-multimedia-measuring dependent variables. Figure 3 presents the model used in this study.

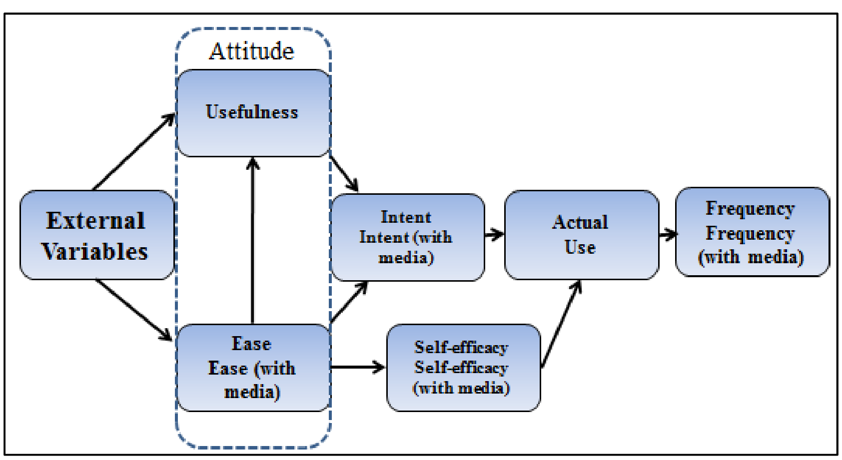

Figure 3. Modified version of TAM for the study, adapted from Davis, Bagozzi, & Warshaw (1989).

The TAM illustrated in Figure 3 should be read from left to right, the progression of user adoption starts at the left and moves onto the constructs pictured at the right.

Significance of the Problem

Research targeting instructors' perceived usefulness, perceived ease of use, behavioral intent to use, perception of self-efficacy, and frequency of use of audio- or video-based technologies associated with the feedback and assessment process has provided useful insight that may be provided to several different entities. The first are the organizations that develop the LMSs. A better understanding of how willing instructors are to use these technologies can serve to inform software companies as they work on future development efforts including updates and modifications to existing LMSs. Implementation of new information systems is expensive and typically is unsuccessful (Legris et al., 2003; Li, Qi, & Shu, 2008; Motaghian et al., 2013), and instructors play a critical role in either a successful or failed system implementation (Motaghian et al., 2013). It is crucial that success factors are identified (Motaghian et al., 2013) so that learning experiences may be customized to the end users' preferences that may provide a better user experience and subsequently increased success related to the implementation.

The second entity that may benefit from this research is the leadership body at universities in the United States. With costs ranging from $60,000 to millions of dollars to evaluate, design, and implement LMS (Black et al., 2007), ensuring that instructors perceive the tools as valuable may be the first step in making sure instructors use them. Read and Geurtz (2012) argued that technological implementations with certain features are more likely to be adopted, whereas Black et al. (2007) suggested the pain associated with implementing a new LMS often stems from universities' ignorance of the needs and desires of instructors who teach in different disciplines and who have varying teaching philosophies and styles. Thus, better understanding of instructors' preferences should help university leadership make decisions that lead to increased LMS adoption and use by instructors.

Educational Significance

The present study has the potential to inform researchers, professors, university leadership, university faculty, and LMS developers about instructors' intentions to use and perceived self-efficacy levels in using LMS functionalities to provide multimedia-based feedback to students. Learning management systems are prevalent in universities throughout the United States and are being used heavily; however, if instructors are unwilling to use technology to provide feedback, student outcomes could be affected negatively (Hattie & Timperley, 2007).

The first possible outcome of the study was a statistically significant difference between the treatment and comparison groups' means of instructors' intent, ease, self-efficacy, frequency, and usefulness of use of audio- or video-based or speech-to-text-recognition technologies associated with the feedback and assessment process. Any statistically significant differences among the dependent variables in the advanced course (treatment group) may signify increased use of the audio- or video-based and speech-to-text-recognition feedback tools that the Canvas® system offers. The present study design included a treatment and a comparison group and helped the research community better understand if basic or advanced training makes a statistically significant difference in instructors' perceptions of self-efficacy, perceptions of usefulness and ease of use, and usage frequencies associated with the provision of audio- or video-based feedback to their students.

Knowing if instructors are willing to use Canvas®' audio- or video-based feedback and speech-to-text-recognition tools may help developers further customize the technical features to meet instructors' preferences. As instructors' preferences are met after completing the training being offered during the present research study, the likelihood that they will use the audio- or video-based or speech-to-text-recognition feedback features increased as measured by intent and usefulness. As intent to use increases, the effectiveness of the tools may be evaluated through future research using student outcomes as a dependent variable.

From a theoretical standpoint, Bandura (1977) argued that whether a person actually makes the effort to do the task is related to a person's self-efficacy, that is, the strength of one's own belief in his or her potential effectiveness at the task. From a perspective of self-efficacy, Buchanan, Sainter, and Saunders (2013) addressed the factors that affect instructors' use of learning technologies. The researchers examined three barriers to adoption of technology among instructors: structural constraints within the university, perceived usefulness of tools, and Internet self-efficacy. The primary result of the study suggested that Internet self-efficacy was associated positively with adoption and use of learning-related technologies among instructors (Buchanan et al., 2013). The present study used perception of self-efficacy as a theoretical construct and had five questionnaire items that measured it. The Buchanan et al. (2013) study and the present study used Likert-style questionnaire items to measure instructor self-efficacy and may help to illustrate instructors' self-perceptions associated with use of several of the LMS tools of interest including audio- or video-based feedback, and the speech-to-text-recognition feature.

As computers, Internet bandwidth, multimedia, and technology in general become more sophisticated in their speed and breadth of functionalities, the LMS and other digital tools will be used increasingly by university instructors to conduct and execute the classes they teach (Lonn & Teasley, 2009; Silva et al., 2010). Early adopters are considered to be innovators as they experiment with bringing increased technologies into the classroom (Smith et al., 2009) and may or may not be more inclined to try new functionalities such as audio- or video-based feedback, or speech-to-text-recognition. Training as the treatment in the present study may have helped to move the nonusers toward the categories of late-majority, early-majority, or even early adopters (of technology).

Given the fear of technology and a lack of understanding around the effectiveness of technological elements of instruction, many instructors are slow to adopt the new technologies that are available to them (McQuiggan, 2012; Prensky, 2007). Instructors are expected to be professional role models for their students and commit to lifelong learning (Kukulska-Hulme, 2012), but recent research suggests that the functionalities of the LMS have been used primarily to distribute learning materials and information transfer and less frequently to communicate with students (Schoonenboom, 2014). Moreover, instructors who use interactive and multimedia-based LMS functionalities such as audio- or video-based feedback can provide their students with varied representations of knowledge, which may enrich the level and quality of interactions between students and their instructors (Mahdizadeh, Biemans, & Mulder, 2008).

When evaluated holistically, the findings from such studies suggest that development opportunities provided to instructors in the form of training may reduce their apprehension about using technology, specifically LMS functionality in the area of multimedia-based feedback and other communication-related activities (Ahmad & Tarmudi, 2012; Falvo & Johnson, 2007; Kukulska-Hulme, 2012; McQuiggan, 2012; Prensky, 2007; Schoonenboom, 2014). Instructors who make use of the training opportunities available to them may expand or extend their knowledge and skill, resulting in additional education-related courses to add to their resumes.

In summary, increased use of multimedia by instructors can bridge the generational gap between instructors who are not well versed in technology use and students who are accustomed to using technology in their day-to-day lives including their schooling.

Research Questions

The methodology that was used to collect data for the present study was designed to answer two research questions:

1. To what extent is there a difference for each group in the change from pretest to posttest in instructors' behavioral intent to use (intent), perceived ease of use (ease), perception of self-efficacy (self-efficacy), frequency of use (frequency), and perceived usefulness (usefulness) in the use of multimedia or nonmultimedia tools for the provision of feedback?

2. To what extent is the change from pretest to posttest on each of the dependent variables different for participants in the treatment and comparison groups?

Dependent variables were evaluated using items that measured either multimedia use or nonmultimedia use within the LMS with the exception of usefulness that only measured nonmultimedia technology use.

Definition of Terms

Throughout the literature related to technology adoption and use, terminologies have been defined in varying ways. For the purposes of the study, the following definitions are provided and are the ones that were used to guide the present study.

Audio- or Video-Based Feedback is defined as direction, guidance, or comments related to a student's school-work provided from instructor to student in either audio or video format. The present study had audio- or video-based feedback usage as a dependent variable within the behavioral intent to use construct.

Behavioral Intent to Use (Intent) The degree to which a person has formulated conscious plans to perform or not perform some specified future behavior (Davis, 1985). In the context of the present study, intent signified any behavioral change among participants that increased their intentions to use LMS functions learned in the training class they completed. For the present study, intent served as a construct and was measured by six questionnaire items.

Canvas® is the LMS used by the university where the present study took place. Canvas® is owned by Instructure and was implemented by the university in 2013.

Feedback is defined as ”information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding that occurs typically after instruction that seeks to provide knowledge and skills or to develop particular attitudes” (Hattie & Timperley, 2007, p. 102). In the context of the present study, feedback was the dependent variable, and the type of feedback the study attempted to better understand was audio- or video-based feedback.

Frequency of Use (Frequency) is defined as how often an instructor uses LMS tools such as audio- or video-based feedback or speech-to-text-recognition as measured from pre- to posttest. For the present study, frequency served as a construct and was measured by eight items.

Learning Management Systems are software applications that allow for the administration, documentation, tracking, reporting, or delivery of learning among schools and universities. For the purposes of the present study, the LMS is an electronic teaching tool that allows for an instructor to record an audio- or video-based feedback-related message for the student. The message is recorded, contained, and delivered through the LMS. The LMS used by the university where the research study is being conceptualized is entitled Canvas®.

Multimedia refers to “the capacity of computers to provide real-time representations of nearly all existing media and sensory modes of instruction” (Mayer, 2005, p. 97). For the present study, multimedia was characterized as feedback provided from instructor to student using the LMS and may be provided in the form of audio- or video-generated or speech-to text-based feedback.

Perceived Ease of Use (Ease) is defined as “the degree to which an individual believes that using a particular system would be free of physical and mental effort” (Davis, 1985, p. 82). For the present study, ease served as a construct and was measured by 10 questionnaire items. The intent of the construct was to better understand if, after being trained, instructors perceived the LMS as easier to use than they did prior to being trained. Change in perception of ease of use was measured using pre- and postanalysis of average scale responses.

Perceived Usefulness (Usefulness) is defined as “the degree to which an individual believes that using a particular system would enhance his or her job performance” (Davis, 1985, p. 82). For the present study, usefulness served as a construct and was measured by nine questionnaire items. The intent of the construct was to better understand if, after being trained, instructors perceived the LMS as more useful than they did prior to being trained. Change in usefulness was measured using pre- and postanalysis of average scale responses. The construct was measured by 13 questionnaire items.

Perception of Self-Efficacy (Self-Efficacy) is one’s belief in one’s ability to succeed in specific situations (Bandura, 1977). For the present study, self-efficacy served as a construct and was measured by eight questionnaire items. The intent of the construct was to better understand if, after being trained, instructors perceived their own skill, abilities, and knowledge higher as a result of the training that they completed. Change in self-efficacy was measured using pre- and postanalysis of average scale responses and the construct was measured by eight questionnaire items.

Training and Professional Development is defined as teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students' growth (Avalos, 2011, p. 10) and served as the independent variable for the study. Participants in both the treatment and comparison groups were trained on basic or advanced LMS functions, respectively.

Speech-to-Text-Recognition Software (also known as voice-recognition technology) is defined as software that converts speech directly into text (Batt & Wilson, 2008). Participants in the treatment group were trained on this advanced LMS function.

Summary

In 2015, the majority of universities both in the United States and worldwide had adopted the LMS as a technical tool to support and foster student learning (Little-Wiles et al., 2012; Woods et al., 2004). Research has suggested that LMS usage for delivery of richer multimedia-based communication, assessment, and interactivity is lacking (Little-Wiles et al., 2012; Schoonenboom, 2014) and that a large percentage of instructors used the LMS for common tasks as opposed to specialized features. Training was cited as a need to bridge this gap (Little-Wiles et al., 2012, p. 9).

The present study added to the body of knowledge by questioning instructors who completed basic or advanced training on LMS use both prior to the training and 4 weeks posttreatment. The inclusion of both a treatment group and a comparison group enabled the researcher to make generalizations of the study participants in the areas of instructors' usefulness, ease, intent, self-efficacy, and frequency of audio- or video-based and speech-to-text-recognition technologies associated with the feedback and assessment process. questionnaire items were developed using the original TAM scales, and the TAM had been identified as the most powerful theory used to describe a human's intention to use technology (Venkatesh & Davis, 2000). A quantitative approach was employed to carry out the study with pre- and posttest design.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of the present study was to investigate how training and professional development effects university-level instructors' intent, ease, self-efficacy, frequency, and usefulness of audio- or video-based technologies using either multimedia or nonmultimedia technologies to provide feedback to students in college-level teaching.

This chapter provides an overview of related empirical literature by reviewing similar studies in the areas of learning management system (LMS) adoption among instructors, ways multimedia may be used in the feedback and assessment process, how technology training for instructors has changed instructors' attitudes related to the use of multimedia for the provision of feedback to students, and how self-efficacy affects instructors' intentions to use new technologies. The literature review section will conclude with detailed information related to the birth and growth of the Technology Acceptance Model (TAM) and a summary of the chapter.

Davis (1985) conceptualized the original TAM to address two major objectives. The first objective was to better understand the concept of end-user acceptance, which would provide "new insights into the design and implementation of new information systems" (p. 7). The second objective was tactical in nature and suggested that the framework would improve the then current understanding of user-acceptance testing (UAT), which would assist those who design and implement systems as they evaluate end-user needs. Davis (1985) posited that applying the TAM during UAT would consist of showing potential end users a prototype of the actual system and would help measure their level of motivation to use the system after its implementation. Measuring motivation would then help the researcher to predict actual system use of the solution being developed, which would help to predict the success of the new system. The present study aimed to measure instructors' intent, ease, self-efficacy, frequency, and use of audio- or video-based technologies associated with the feedback and assessment process in college-level teaching.

The similarities between Davis' (1985) original intention of the TAM and the present study made the TAM a logical choice to be the theoretical framework of the study. Davis (1985) also suggested that the TAM may be useful for system designers and implementers as they evaluate and conceptualize the elements of the system being designed. Davis (1985) suggested that the TAM could support system design and user acceptance testing though demonstrations of the new system to potential end users and include activities oriented in measuring potential users motivation to use the new system leading to an increased understanding of the potential for use and consequently the likelihood of success of the system being proposed for build and implementation.

The TAM helps to explain the acceptance and level of use of new technology among end users and suggests that when end users are presented with a new technology several factors influence their decision to use it and, if so, when they will begin. The TAM has been cited more than 700 times in published research and has been used for many different applications by participants throughout the world who have found statistically significant results for the high relationship between usefulness and intent (Chuttur, 2009). The TAM has been used by many different countries including the USA, the UK, Taiwan, Hong Kong, Switzerland, Japan, Australia, Turkey, Canada, Kuwait, Nigeria, France, Singapore, China, and Finland to assess the intent to use many technical solutions such as email, voicemail, word processing, spreadsheet use, presentations, database, hospital information systems, and decision-support systems (Chuttur, 2009). A 2006 meta-analysis of the TAM evaluated 88 published research studies and found that the applicability of the TAM was robust with a widespread footprint and that additional areas of applicability were identified (King & He, 2006). Technology Acceptance Model study participants have included students (both undergraduate and graduate), knowledge workers, physicians, bank managers, programmer analysts, information-technology (IT) vendor specialists, computer programmers, Internet users, brokers, and sales assistants (Chuttur, 2009).

Davis' (1985) dissertation introduced the TAM and sought to answer three questions. The first question addressed major motivational variables that mediate between system characteristics and actual computer system use among end-users in organizations. The second question analyzed how the variables were related causally to each other, to the system characteristics, and to end-user behavior. The third question assessed how user motivation would be measured prior to the implementation of the system within the organization in an effort to predetermine end-user adoption and satisfaction (Davis, 1985, p. 7).

The constructs of the TAM are perceived usefulness, perceived ease of use, attitude toward using, behavioral intent to use, and actual system use, which constitutes the output of the model (Davis, 1989). The present study used all of the constructs mentioned except attitude toward using and added the construct of self-efficacy to align with the interests of the researcher. The present study also added a multimedia variable to each variable listed that was measured by multimedia-oriented questionnaire items.

Perceived usefulness and behavioral intent to use were found to be highly reliable per the results of a 2006 meta-analysis of the TAM and may be used in a variety of contexts (King & He, 2006).

The present study was designed to address similar questions to Davis (1985) in the context of how university instructors use new LMS tools, including electronic document mark-up capabilities, audio- or video-based feedback messaging, and a speech-to-text-recognition feature. In addition, the TAM was used as the theoretical framework to better understand how basic and advanced training increases instructors' intent to use the LMS tools and if one or the other has a higher likelihood to increase behavioral intention to use the relatively new LMS tools. Davis (1985) aimed to generate knowledge related to acceptance of information technology and used a measurement scale offering a 7-point Likert-style set of questions. The ends of the scale were marked as *likely* and *unlikely;* and three selections were associated with *likely* and three choices associated with *unlikely*. An option of *neither* was offered for respondents to opt out of marking either the likely or unlikely areas of the scale (Davis, 1989).

Researchers have found that instructors do not make adequate use of technology when teaching (Aldunate & Nussbaum, 2013). Research has focused heavily on instructors' intentions to adapt to new technologies in educational settings (Ajjan & Hartshorne, 2008; Aldunate & Nussbaum, 2013; Ferdousi & Levy, 2010; Morgan, 2003; Motaghian, Hassanzadeh, & Moghadam, 2013; Schoonenboom, 2014; Wang & Wang, 2009; West, Waddoups, & Graham, 2007). Instructors tend to be apprehensive about integrating new technologies into their teaching regimen because of their lack of knowledge and ability to learn new systems (Wang & Wang, 2009). Moreover, instructors' lack of proficiency in feedback and assessment, multimedia, and technology suggests that there is a need to close the gap between instructors with extensive teaching and subject-matter expertise and those with less experience using technology when teaching (Ahmad & Tarmudi, 2012; Falvo & Johnson, 2007).

As technology has become more important and prevalent in higher education, the use of LMS and other forms of online interaction has increased exponentially (Ferdousi & Levy, 2010). Without LMS, it can be difficult for instructors effectively to manage information and content generated throughout the semester (Falvo & Johnson, 2007). As new technological systems are offered as options for instructors, relevant training and support has been found to increase end-user satisfaction on behalf of instructors (Najmul, 2014).

Researchers conducting a meta-analysis on use of the TAM have found that perceived usefulness (usefulness) and behavioral intent to use (intent) are highly reliable constructs that may be used in varying contextual situations (King & He, 2006). The influence of usefulness on intent has been described as "profound" (King & He, 2006, p. 751) and also captures the majority of the influence on perceived ease of use (ease). Also, the use of usefulness and intent as theoretical constructs is important for the successful implementation of Internet-based applications such as LMS (King & He, 2006).

The empirical literature in the context of three areas is evaluated in this chapter. These areas were germane to the study and were derived from the constructs of the TAM. The three areas are (a) LMS adoption by instructors, (b) multimedia uses in feedback and assessment, and (c) training and professional development for technology use.

Learning Management System Adoption by Instructors

The two most common infrastructure choices used in university-level learning are the LMS and e-Learning. Weaver, Spratt, and Nair (2008) described the growth of LMS use from 1998 to 2008 as enormous, and since 2006 more than 95% of universities have used LMS (Little-Wiles, Hundley, Worley, & Bauer, 2012; Woods, Baker, & Hopper, 2004). This section focuses on LMS and instructors' intentions to use them. The LMS was defined by Szabo and Flesher (2002) as the technological infrastructure that allows for delivery and management of instructional content. Learning management systems provide many tools and options for instructors to distribute files, manage class rosters, manage grading, hold both synchronous and asynchronous discussions, and, in some cases, hold classes online. Specific functionalities of the LMS include the delivery of instructional content, assessment through the administration of quizzes or exams, dissemination of class documents, collaboration between students and instructors, management of feedback and assessment, and management of face-to-face classroom learning environments (Falvo & Johnson, 2007). Additional functionalities of the LMS include discussion lists, communication bulletin boards, embedded email, embedded video, embedded audio, video or text chat, integration with social media, and access from tablet and mobile devices (Weaver et al., 2008). The audio- or video-based functions of LMS were the primary focus of the present study.

The academic community has used a large body of research-based knowledge to better understand the motives and intentions of instructors in relation to LMS, technology, and multimedia use. Pituch and Lee (2006) had argued that the failure to adopt LMS would lead to a lack of use and its eventual abandonment, rendering the system useless. In 2009, Wang and Wang published quantitative research using structural equation modeling (SEM) to examine instructor adoption of web-based learning systems (similar to LMS). Given the ongoing trend of purchasing and implementing LMS, the number of users actually using the systems was not increasing at the expected rate due to adoption of new technology being a "complex and multidirectional issue" (Wang & Wang, 2009, p. 761). As a result, Wang and Wang (2009) attempted to answer two research questions:

> (a) identify the factors that affect instructor adoption of web-based learning systems at universities in Taiwan, and (b) to develop and empirically examine an integrated model of adoption of web-based learning systems, incorporating user intention and behavior, information system success and psychology. (p. 761)

Wang and Wang (2009) used a 58-item questionnaire based on nine constructs in the literature, including information quality, system quality, service quality, self-efficacy, subjective form, perceived ease of use, perceived usefulness, intention to use, and system use. The questionnaire was pilot tested with 20 instructors from varying universities and was evaluated for reliability using Cronbach coefficient alpha. Items with reliability scores below .07 were discarded. Eight items were discarded due to low item to total correlations assessed using a 7-point Likert scale ranging from *strongly disagree* to *strongly agree* (Wang & Wang, 2009). Email invitations were extended to 549 full-time instructors from different universities, and 302 responses were received. After a preliminary screening, 268 respondents were invited to participate in the study. Seventy-eight percent of the respondents were male, and 22% were female; 66% of respondents were between 31 and 50 years of age. More than 70% of respondents had more than 6 years of teaching experience.

Twelve hypotheses were tested using SEM. The hypotheses most relevant to the present study are discussed. Hypothesis H1, which was supported, suggested that higher levels of information quality in web-based learning systems would predict increased perceived usefulness ($\beta = .5$). Another hypothesis that was supported suggested that increased service quality of web-based learning systems predicted perceived ease of use ($\beta = .53$). System quality was found to have increased effect on perceived ease of use ($\beta = .23$), but no statistically significant effect on perceived usefulness (Wang & Wang, 2009).

Wang and Wang (2009) attempted to investigate factors that contribute to instructor adoption of web-based LMSs at the university level. Perceived ease of use was predicted by system quality, service quality, and self-efficacy, with service quality being the strongest predictor. This result may be interpreted as an important need to provide timely support to instructors when they are new to LMS. This need may have been fulfilled within the researcher's university as a result of the present study. This finding is supported by adult learning theory, which suggests that adults desire to be given short new tasks when new to a system and eventually left alone to pace themselves as their experience increases and their confidence comes to fruition (Cercone, 2008). The finding that system quality lacked a direct effect on usefulness was not consistent with the literature, but it was consistent with one study showing that reluctant instructors may not recognize fully the benefits of a web-based system and may believe that computer system inclusion reduces their level of control when teaching (Wang & Wang, 2009). Wang and Wang (2009) also found that instructors' needs should be taken into consideration when designing and developing LMSs, as this consideration was shown to increase usefulness, which led to increased intention to use new systems.

Park, Lee, and Cheong (2007) attempted to investigate the level of acceptance of a new electronic courseware system (similar to a LMS) by university instructors. The study also intended to test applicability of the TAM in a research setting. The key objectives of the study were to investigate further knowledge associated with instructor intent to use an electronic courseware system (similar to a LMS) called "eClass" and to test the applicability of the TAM in implementing eClass. In their qualitative study, Park et al. (2007) had two objectives: (a) to generate information related to electronic courseware in the areas of perceived ease of use, perceived usefulness, motivation on behalf of the instructor member, compliance with the policies of the university, success of instructional technology clusters, and evaluation of the functions of the courseware system and (b) to compare current system use against the behavioral intentions of the instructor member. The study took place at a private research university in the Western United States where a 2-year pilot course management system was being implemented concurrently. The study was associated with the Department of Information and Communication Technology (ICT) in teaching and research. This department introduced the new eClass system to faculty and instructors and offered training and workshops to help students learn as they adopted the system (Park et al., 2007).

The Park et al. (2007) study contained 15 hypotheses intended to gauge two of the constructs contained within the technology acceptance model (TAM). These constructs were perceived usefulness, defined in Davis' (1985) dissertation as "the degree to which an individual believes that using a particular system would enhance his or her job performance" (p. 82), and perceived ease of use, "the degree to which an individual believes that using a particular system would be free of physical and mental effort" (p. 82). Previous research had supported an effect of perceived ease of use on behavioral intention to use (Motaghian et al., 2013; Schoonenboom, 2014). Park et al. (2007) also hypothesized that the perceived ease of use of the eClass system would have a positive effect on two constructs contained within the TAM: perceived usefulness and behavioral intention to continue use. The construct of behavioral intention to use the eClass system was connected largely to the construct of perceived usefulness (Davis, Bagozzi, & Warshaw, 1989); perceived usefulness also had been correlated to the construct of behavioral intention (Davis, Clevenger, Posnock, Robertson, & Ander, 2015; Venkatesh & Davis, 2000).

Instructors were invited through email to complete the 15-minute questionnaire. The participants had an average of 12 years of teaching experience and had used computers for either teaching or research purposes for about 14 years. Most participants had used the eClass learning system for a little over two semesters, and four participants were new users of the system. Instructors who had used the system had tried it out in at least three classes and about 10% of the participants had used e-Class in at least six courses. All instructors who were registered to use eClass were emailed regardless of whether they were currently using the system. The questionnaire was available for about 3 months, and confidentiality of the data was promised to the participants. Two reminders were sent to the instructors who were invited to participate, and upon closure of the data-collection window, 225 instructors had responded or about one half of the user population. Many responses were deemed unusable because of missing data, leaving

191 participants who completed the questionnaire in its entirety. The constructs associated with the study were measured using questionnaire questions and Likert-type response scales. The study used several of the same constructs as the present study including ease, usefulness, and intent. Cronbach coefficient alpha results suggested that the constructs of usefulness and ease were well-measured by the questionnaire items and had values above .80. The hypotheses associated with the study were evaluated using multiple regression analyses that were extended with a path analysis that estimated the magnitude and statistical significance of the hypothesized causal connections between the sets of variables. Both direct and indirect effects were found and motivation was found to have effects on all variables whether direct or indirect (Park et al., 2007).

Of the 16 hypotheses tested by Park et al. (2007), the following results relevant to the present study were realized. The most noteworthy statistically significant beta weights from the regression analyses were when usefulness ($\beta = .48$) and ease ($\beta = .25$) were used as independent variables and behavioral intention to keep using was the dependent variable (in the path analysis). These findings suggested that usefulness and ease successfully predicted behavioral intention to keep using the system. Anecdotally, these findings provided some rationale by establishing some similarity for the present study by addressing instructor’s intentions to use functions that were new to them. Other dependent and independent variables that were path analyzed produced nonstatistically significant results and were not discussed in detail. See Table 1 for the variables, beta weights, and correlation coefficients from the study.

Table 1

Theoretical TAM Proposition Mapped to Hypotheses Associated with the 2007 Park et al. Study

Dependent Variable	Independent Variable	*β*	R^2
Perceived Ease of Use	Motivation	.19	.05
	Instructional Technology Cluster	.06	
Perceived Usefulness	Perceived ease of use	.63	.46
	Motivation	.15	
	Instructional Technology Cluster	.04	
Evaluation of Functions	Perceived usefulness	.41	.34
	Motivation	.23	
	Instructional technology cluster	.20	
	Compliance with school policy	.13	
Current system use	Evaluation of functions	.40	.16
	Compliance with school policy	-.07	
	Compliance with school policy	.13	
Behavioral intention to use	Perceived ease of use	.25	.44
	Perceived usefulness	.48	
	Compliance with school policy	-.10	
	Evaluation of functions	-.07	
	Current system use	.03	

Note. Table adapted from Park et al. (2007).

Park et al. (2007) confirmed that perceived ease of use had a statistically significant effect on perceived usefulness and a direct effect on behavioral intention to use and that ease flowed into actual system use through usefulness and EOF of the computer system. In addition, usefulness was found to have a direct effect on intent and an indirect effect on actual system use, which was consistent with findings associated with the original TAM (Davis, 1985). The present study also used the TAM and may result in similar findings as the Park et al. (2007) study.

As indicated, Park et al. (2007) used a questionnaire with 4- and 5-point Likert scales for five of the variables. Three variables used only one item to collect data and were used in the analysis as dependent variables. Also, the study was not designed with pre- and posttest measures, which could have resulted in a stronger argument of generalizability to the larger population if designed as a pre- and posttest.

In 2013, Motaghian et al. continued the work of Wang and Wang (2009) with a study addressing factors affecting university instructors' intentions to adopt a new web-based LMS. The stated purpose of the study was to "assess the influence of information-system oriented, psychological, and behavioral factors on instructors' adoption of a web-based learning system" (Motaghian et al., 2013, p. 158). This follow-on study used the same instrument as Wang and Wang (2009) and an extension of the TAM as the theoretical framework. This extended model is discussed later in detail.

A convenience sample of 115 university instructors in Iran agreed to participate (Motaghian et al., 2013). Ninety-three percent of the participants were male and only 7% female. Seventy-four percent of respondents held a PhD, and more than 70% of respondents had more than 6 years teaching experience. Data were analyzed using SEM and LISREL. Several goodness of fit indices were used to validate the data-analysis approach, which suggested that the model indices had a good fit for the data and that SEM was an appropriate structural model for the study (Motaghian et al., 2013). Constructs associated with the study included information quality, system quality, service quality, self-efficacy, subjective norms, perceived ease of use, perceived usefulness, intention to use, and system use.

Motaghian et al. (2013) found that information quality, service quality, subjective norm, and self-efficacy increased instructors' perceived ease of use of the web-based LMS. The influence of self-efficacy outweighed information quality, subjective norms, and service quality in terms of overall influence on system use. Effective support provided in a timely fashion is paramount to successful system implementation, as these support mechanisms result in reduced time and effort required for instructors to begin using the new LMS (Motaghian et al., 2013).

All three of the studies reported in this section (Motaghian et al., 2013; Park et al., 2007; Wang & Wang, 2009) used either the TAM or a variation thereof. The totality of the findings emphasized different implications of the constructs contained within the TAM. The two studies that followed each other found that system quality, service quality, and self-efficacy had similar influences on end-users' ease (Motaghian et al., 2013; Wang & Wang, 2009), whereas Park et al. (2007) found that ease had a statistically significant effect on usefulness. These findings are not surprising because the original TAM was found to have the same characteristics as far back as the late 1980s. The research community has accepted that ease has an effect on usefulness (Bagozzi, Davis, & Warshaw, 1992; Davis, 1985; Davis, Bagozzi, et al., 1989; Davis, Clevenger, et al., 2015; Venkatesh, Morris, Davis, & Davis, 2003), and more recent studies that defined system quality, service quality, self-efficacy as external variables to the TAM have shown that these variables are relevant as inputs to the TAM (Motaghian et al., 2013). Other external variables used as inputs to the TAM have included system expertise, level of education, and age (Burton-Jones & Hubona, 2006); trust and image (Wu et al., 2011); and job relevance, output quality, and result demonstrability (Venkatesh & Davis, 2000).

The studies presented in this section are useful in establishing context; however, they are based on convenience samples and do not reflect true experimental research. The present study was not experimental but was designed with pre- and posttest measures added to the body of knowledge with resulting data that illustrate correlations between advanced LMS training and increased behavioral intention to use and actual system use.

Multimedia Uses in Feedback and Assessment

Feedback is relevant and ultimately used to drive cognitive and behavioral changes within the student (Mory, 2004). Feedback can be defined as a broader view of the student's performance academically and is to be considered an element of enhancement in learning (Askew, 2004).

Hand-written feedback may be problematic as it can be both illegible and difficult for the student to interpret (Hung, 2016). A 2012 study analyzed student perceptions of feedback in the form of either Microsoft Word comments or audio- or video-based commentary and found that the modality of feedback effected students' perceptions of both the process of revising their work and of their relationships with their instructors (Silva, 2012). More recently, immediate feedback may be provided to the student through a computer in the form of multimedia-based feedback that now can be delivered through an LMS (West et al., 2007). Researchers have evaluated animation, presentation types, cooperative learning, richness of media, and if multimedia improves feedback in general in an attempt to better understand the concept of multimedia-based feedback.

A study from 1999 illustrates the ongoing research and focus of varying communication mediums by examining media-richness theory. The purpose of the study was to analyze the effect of text, audio, video, and face-to-face communication in relation to task performance and satisfaction including both intellective and negotiation tasks (Suh, 1999). The experimental study employed a 2 x 4 factorial design using intelligence and negotiation for two levels of task types and text, audio, video, and face to face as media types. Three-hundred-sixteen participants received course credit for their participation, and a prize of $20 was offered for top performers within their dyad. The present study offered a similar incentive for participation (a $15 Target gift card). Participants were assigned randomly to 12 treatment conditions and were pretested using a questionnaire (Suh, 1999). The independent variables of the study were intellective and negotiation (these were task types) and the four media types previously mentioned. Dependent variables included task performance and task satisfaction. The overall results of the study suggested that there were no task-medium effects on decision quality or decision time and that decision quality was the same for all communication media on both intellective and negotiation; however, means and standard deviations for process satisfaction did show slightly higher values for oral communication (M = 4.43, SD = 1.05) over written communication (M = 4.28, SD = 1.02) suggesting that audio- or video-oriented communications may be valued more than written communications (Suh, 1999).

The Suh (1999) study was relevant to the present study in that media, richness, communication, medium, and satisfaction are all factors contained within the study that uses multimedia and instructors' self-efficacy levels and intent to use it as its basis. The Media Comment Tool in Canvas® offers only asynchronous audio- or video-feedback functionalities, and they were taught to instructors in the treatment group to investigate if intent and comfort increased, stayed the same, or decreased.

A 2009 study that employed a quasi-experimental approach focused on podcasting and the potential for podcasts to replace professors and assigned 40 participants to each condition. The conditions were to either attend the class lecture in person or to listen to the class lecture as narrated PowerPoint® slides at home. The inclusion of audio in the at-home group provided relevancy to the present study as the study aim was to assess instructors' self-efficacy and intent in the activity of recording audio narration for teaching purposes, feedback in particular. In the McKinney, Dyck, and Luber (2009) study, podcast replaced the face-to-face instruction, it was not a supplement. An initial independent-samples *t* test indicated that the podcast group had statistically significantly better exam results (*M* = 71.24%, *SD* = 16.50%) than the face-to-face lecture group (*M* = 62.47%, *SD* = 17.03%; McKinney et al., 2009). Learning was further gauged by analyzing the amount of note-taking applied by the learner and by number of times that the learner listened to the audio podcast. Review of the study was included to illustrate the need for a better designed and comprehensive study, one that was truly experimental in nature and that used random assignment and three groups: treatment one (direct instruction), treatment two (self-paced work instruction), and a comparison group that received no treatment.

A study published in 2009 also used PowerPoint® and podcasting as the research focus. The study evaluated synchronized versus nonsynchronized audio messaging and found that synchronized audio or video media are more effective than providing separate media items with the same instructional content (Griffin, Mitchell, & Thompson, 2009). Similar to the design of the present study, the study employed an experimental design with 90 participants who were full-time college students of science and social-science oriented disciplines.

A meta-analysis that originally was conducted in 1980 and updated in 1991 reviewed 254 controlled evaluation studies on computer-based instruction (CBI). The meta-analysis found that CBI usually produced positive effects on students; standard deviations of exam scores were raised .30 across learners of all levels that were equated to effect sizes of moderate levels (Kulik & Kulik, 1991). Much like television and radio being present in society for many years, audio or video feedback may be appreciated by students and may lead to increased learning outcomes. The present study helped to gauge the likelihood that instructors' will adopt these mediums by assessing intent and perceived usefulness. Future studies may then focus on student outcomes and satisfaction among other relevancies in the area of multimedia, teaching design, communication, and feedback and assessment.

This section contained two specific methods to provide instruction and feedback to students. Empirical research that focused on multimedia and audio or video technologies were reviewed in order to provide context to the study. The studies reviewed were quantitative in nature as was the present study. Similarly designed research has been helpful in making connections and comparisons to future research as new research ideas often come from the results or outcomes of previous studies.

If instructors are unwilling to use multimedia-based feedback, there may be no value in building, selling, and implementing it. The present study helped to extend knowledge related to instructors' intent and self-efficacy in using multimedia-based feedback and may be an important input to the university administration's evaluation of

LMS usage, specifically the audio or video tools available through Canvas®. Much of the feedback-oriented research literature used quantitative measures including analysis of variance for data analysis. For the present study, a set of independent-samples *t* tests were used to compare means across the two groups (treatment and comparison).

Another feedback-related study that used quantitative measures investigated the effects of an animated agent's presence on types of feedback in learning, motivation, and cognitive load in a science-oriented multimedia learning environment. Lin et al. 2013 employed 135 students from a Southwestern university in the United States and used a pretest-posttest 2 x 2 factorial design. The factors were animated agent with narration versus narration only and simple feedback versus elaborate feedback. Participants who learned from the animated agent that delivered elaborate feedback had statistically significantly higher scores compared with those who learned with an agent that provided simple feedback (Lin, Atkinson, Christopherson, Joseph, & Harrison, 2013). The study is in line with the goals of this reported study and provided relevant context in the conceptualization and design of the study.

A 2009 multimedia-oriented study that was quantitative in nature examined whether cooperative learning and feedback facilitated situated and example-based e-Learning in the discipline of statistics (Krause, Stark, & Mandl, 2009). The study employed 137 randomly assigned students whose number was largely female (105 females; M = 23.82 years, SD = 5.08) at a European university and used a 2 x 2 factorial design with pretest and posttest measures. Students provided with the feedback intervention scored higher on average than those who had worked-example feedback. A 2 x 2 analysis of variance (ANOVA) with social context and feedback intervention posttest scores as the dependent variable showed a statistically significant main effect for feedback $F(1, 133) = 32.91$ (ES = .20, which is a large measure of practical importance Krause et al., 2009).

These feedback-related studies exemplify the research related to feedback using technology. Taking into account teaching machines from earlier eras and the LMS of today, the body of knowledge associated with feedback is prevalent. Types of media used for feedback purposes have been the focus of several studies (Kahai & Cooper, 2003; Krause et al., 2009; Lim, O'Connor, & Remus, 2005; Lin et al., 2013). Lacking from the literature is research specific to a built-in LMS functionality that allows for audio- or video-recorded feedback to be created by the instructor and provided to the student. Given this gap, the present study evaluated instructor's intent and self-efficacy level in using the Canvas® audio- or video-based feedback tools after having been trained. The comparison group in the present study was not trained on the audio- or video-based feedback tools.

Training and Professional Development for Technology Use

Research related to instructor adoption of technology is prevalent in the literature, and some findings have suggested that training and professional development, interaction with peers, and access to ongoing support help to increase confidence levels, comfort levels, self-efficacy, and behavioral intent to use the technologies available to them (Herman, 2012; Lackey, 2011; Najmul, 2014).

The use of technology in education also has been characterized as ubiquitous (Shih & Chuang, 2013), and empirical research has found that, when used properly, technology has had a positive effect on student outcomes (Hicks & Hicks, 2006; Schrum et al., 2007). Effective use of technology in the classroom requires technological-pedagogical-content knowledge on behalf of the instructor and is critical in addressing the evolving paradigm of teaching in the digital age (Shih & Chuang, 2013). Germane to the successful use of technology in the classroom is training and professional development for instructors; however, this need has been characterized as "one of the most significant stumbling blocks to the use and integration of technology in both teaching and learning environments at all educational levels" (Shih & Chuang, 2013, p. 109). The present study aimed to provide a better understanding of how training on the use of technological multimedia-based tools changes instructors perceived usefulness, perceived ease of use, behavioral intent to use, perception of self-efficacy, and frequency of use of audio- or video-based technologies associated with the feedback and assessment process in university-level teaching.

Access to training that prepares instructors to use technology when teaching is not always readily available; however, when it is available, instructors should take advantage of it due to the rapidly changing paradigm of the technologies available to them (Reilly, Vandenhouten, Gallagher-Lepak, & Ralston-Berg, 2012) and due to the expectations of students in what has become a technically driven world (Vincelette & Bostic, 2013).

New complexities and pressures are driven by an increasingly diverse body of students (Alvarez, Guasch, & Espasa, 2009; Hanson, 2009; Rienties et al., 2012; Volman, 2005) resulting in instructors facing a struggle to learn and make use of technology in the classroom. Therefore, higher education institutions should provide training and professional development and support in an effort to highlight the complex balance of technology, pedagogy, and content in their classes (Rienties, Brouwer, & Lygo-Baker, 2013).

Results from a 2013 study intended to further knowledge related to the effects of professional development on instructors' beliefs and intentions toward the use of learning technology suggested that as students become more familiar with social-learning tools they begin to expect similar modes of instruction and communication in the classroom. Specifically, the Rienties et al. (2013) study intended to investigate if instructors who completed an online training program would experience increased confidence in their abilities to balance technology with pedagogy in their teaching and implement information communication technology (ICT) in their classrooms.

The study was set in the Netherlands, and 33 instructors from four different universities completed four online training modules on collaborative knowledge building, Web 2.0 educational applications, measuring knowledge and understanding, and supervision of students in distance-learning environments (the study started with 81 participants and had heavy attrition; however, the dropouts were useful in answering the third research question). The four training modules were designed to be completed in 8 to 12 weeks, and the total training duration was 20 to 25 hours. The self-paced online trainings were followed by a synchronous online discussion forum in which they could discuss their teaching and learning challenges with instructors from other universities. The average age of the participants was 41, and 55% were male. Ninety percent of participants were from the Netherlands and remaining participants were from neighboring European countries.

Pretest data were collected using an 18-item questionnaire that assessed the usage of technology when teaching, expertise in teaching in collaborative-learning settings, content and pedagogical knowledge, technical pedagogical knowledge, technical content knowledge, and technical-pedagogical-content knowledge (TPACK) along with the Teacher Beliefs and Intentions (TBI) questionnaire. The instruments used 5-point Likert scales with one representing the *totally disagree* and five representing *totally agree* and each construct was measured using between one and four questionnaire items. The TPACK subscale contained 11 items. The subscales measuring teacher beliefs and intentions had between six and nine items per construct. To gauge change from pretest to posttest, the questionnaires were completed by participants both before and after the training event (Rienties et al., 2013). The present study used a similar pre-and posttest approach to data collection.

Results suggested that the effect of the online training classes increased instructors' ability to use technology, teaching pedagogy, and content knowledge (TPACK scores were higher at posttest than they were at pretest). A paired-samples *t* test revealed that there was an increase in participants' use of technology in their daily teaching practices and also in their self-perception of technical-pedagogical-content knowledge, as measured on a 95% confidence interval, and with a moderate effect size noted (Rienties et al., 2013). See Table 2 for means, standard deviations, paired-samples *t*-test results, and Cohen's *d* values associated with the first research question.

Table 2

Means, Standard Deviations, Paired-Samples t-Test Results, and Cohen's d Values for Question 1 of Rienties et al. (2013) Study

	Pretest		Posttest			
Constructs	*M*	*SD*	*M*	*SD*	*t* test (*df*=32)	*d*
Use of technology-enhanced learning	3.27	0.90	3.52	0.78	2.30	.30
Expertise in teaching and collaborative learning	3.58	1.00	3.61	1.12	0.23	.03
Content and pedagogical knowledge	4.06	0.79	4.18	0.85	0.78	.15
Technical pedagogical knowledge	3.41	0.77	3.70	0.59	2.00	.38
Technical content knowledge	3.48	0.80	3.58	0.72	0.95	.13
TPACK	3.54	0.52	3.74	0.37	2.30	.38

Note. Paired-samples *t* test (2-sided test; $n = 33$). Information adapted from (Rienties et al., 2013).

The results of this research question provided some rationale that the present study would be of value to instructors who take training to learn multimedia-oriented LMS tools.

The effects of the training on instructor beliefs and intentions toward teaching facilitation and knowledge transmission did not support the original expectation that instructors would utilize more student-centered learning after the treatment. It was concluded that academics did not become more student-centered even though there were decreased beliefs related to knowledge transmission (Rienties et al., 2013). Table 3 contains the means, standard deviations, paired-samples *t*-test results, and Cohen's *d* values associated with the second research question.

Table 3

Means, Standard Deviations, Paired-Samples t-Test Results, and Cohen's d Values for Question 2 of Rienties et al. (2013) Study

	Pretest		Posttest		
Constructs	*M*	*SD*	*M*	*SD*	*t* test (*df*=32)
Beliefs toward learning facilitation	4.05	.44	4.02	.41	-0.38
Beliefs toward knowledge transmission	3.56	.49	3.49	.49	-1.20
Intentions toward learning facilitation	3.91	.36	3.95	.41	0.77
Intentions toward knowledge transmission	3.80	.39	3.68	.37	-2.00

Note. Paired-samples *t* test (2-sided test; $n = 33$). Information adopted from (Rienties et al., 2013).

The third research question investigated the difference in teacher beliefs and TPACK scores between participants who did or did not complete the 12-week training sessions. No statistically significant difference was found between participants who completed or did not complete the training. The TBI scales suggested that teachers who failed the course believed more highly in training students for jobs (Rienties et al., 2013). Teachers who failed the course spent an average of 2 hours and 18 minutes interacting with the content ($SD = 2.03$), and those who passed the course spent about 5 hours ($SD = 3.24$) learning the content.

Instructors need to be able to develop their skills and expertise in a safe, powerful, and cost effective manner (Rienties et al., 2013). Higher-education institutions need to provide adequate training, professional development opportunities, and support to acquire information communication technology and pedagogical skills. The majority of research studies on faculty development measure learning satisfaction as opposed to a more useful metric of change in teacher beliefs and intentions toward student-centered learning and the use of technology in teaching (Rienties et al., 2013). The present study intended to support the above claim by suggesting statistically that training increases instructors' intent to use new Canvas® functions.

Self-Efficacy and Instructors Intentions to use New Technologies

The construct of computer self-efficacy suggests that an end-user has the belief that they possess the capability to perform a particular behavior when using a computer (Hayashi, Chen, Ryan, & Wu, 2004). Several studies conducted in the late 1980s and early 1990s found a relationship between self-efficacy and enrollment in computer training courses within universities increased adoption of technology, innovation, and performance in computer training classes (Hill, Smith, & Mann, 1987). Bandura (1986) extended his work on self-efficacy by clarifying that end-users abilities to organize and execute on their behaviors associated with computer use were judgments of their own capabilities as opposed to their display of actual computer-related skills (Bandura, 1986). Additional research further clarified Bandura's model by adding magnitude (measured by the level of task difficulty), strength (the confidence one has in surpassing the difficulty), and generality (how the user's expectations generalize to other situations, Saadé & Kira, 2009).

A 2004 study that focused on increasing preservice teacher's self-efficacy for technology use examined the relationship of (a) vicarious learning experiences and goal setting and (b) preservice teacher's judgments of self-efficacy when faced with new technology integration within their teaching environment (Wang, Ertmer, & Newby, 2004).

Participants were recruited from a university class entitled introduction to educational technology, and 280 participants fully completed the requirements of the study. Data were collected using pre- and postquestionnaires comprised of 21 Likert-type items that measured self-efficacy beliefs by inquiring about their levels of confidence for technology use. Data were analyzed using a 2x2 mixed factorial design, and four experimental conditions were developed using the independent variables from the study including: (a) no vicarious condition and no goal setting (this was the comparison group), (b) no vicarious experience and with goal setting, (c) vicarious experiences and no goal setting, and (d) both vicarious learning experiences and goal setting (Wang et al., 2004).

Eighteen laboratory sessions from the course were assigned randomly to the four experimental conditions. A questionnaire measuring demographics was administrated to gather information such as age, gender, major of study, previous classes completed in the area of computer use, self-judgment of confidence, and current understandings of past computer use for teaching purposes. During week 6 of the semester, both the demographics and premeasures questionnaires were administrated. The questionnaires were administrated electronically, and the participants in the treatment groups also completed either a CD-ROM or web-based learning intervention (Wang et al., 2004).

The postmeasures questionnaire data revealed that the vicarious experiences with goal-setting group had the highest mean related to participants' ratings of self-efficacy for technology integration (Wang et al., 2004) and the no-vicarious-experiences and no-goal-setting group had the lowest means (Wang et al., 2004). The largest standard deviations were found among the comparison group, whereas the vicarious-experiences and goal-setting group had the lowest.

The study results were similar to previous studies with statistically significant outcomes associated with instructors' judgments of self-efficacy and found that providing instructors with the opportunity to observe other instructors as they used technology helped to increase their perception of self-efficacy for technology use (Wang et al., 2004). The present study provided a similar learning opportunity.

Technology Acceptance Model

Davis (1985) used Ajzen and Fishbein's (1980) theory of reasoned action (TRA) as an input to the TAM; the theorists postulated that a person's intention to either perform or not perform a new behavior constituted the immediate determinate of that behavior; moreover, social pressure helped the user decide to use or not to use the new system. Social pressure may constitute a work-related need, but it can be rooted within the personal desires of the technology user, such as wanting to communicate with others using a new medium. Although the usability of the TRA extends past technology adoption, there are three boundaries of TRA within the context of prediction of behavior: (a) behavioral intentions are under the voluntary control of the individual, (b) the intent on behalf of the user does not change prior to the performance of the task, and (c) the measures of intention may correspond to the behavioral criteria related to action, target, context, time, and specificity (Liker & Sindi, 1997).

These boundaries help to provide context related to the early thinking of the theorists and their associated work prior to development of the TAM. Behavioral intentions, intent on behalf of the user, and measures of intention are all concepts associated with the TAM and of the present study.

The predominant external driver to technology adoption mirrors the framework of the present study and is often either implementing a new LMS or adding new tools to an existing LMS. Instructors tend to increase their breadth of use as they notice additional tools, have discussions with colleagues, or learn new information in training sessions (Morgan, 2003). The present study posited that advanced training in new LMS tools would lead to increased use (of the tools) among study participants. Motaghian et al. (2013) investigated if external variables would increase perceived usefulness and perceived ease of use of a web-based learning system using nine constructs as inputs to system use; three of which were considered external variables (information quality, system quality, and service quality). All three of the variables were found to have "generally positive perceptions of the system quality, information quality, and service quality" (Motaghian et al., 2013, p. 162) and illustrated how perceived ease of use and perceived usefulness mediated the external variables (Table 4).

Table 4

Constructs, Means, and Standard Deviations Used in the 2013 Course Management Study

Construct	Mean	SD
Information quality	5.23	0.08
System quality	5.10	0.91
Service quality	4.94	1.07
Self-efficacy	5.15	1.02
Subjective norm	5.29	0.89
Perceived ease of use	5.17	0.98
Perceived usefulness	4.81	1.20
Intention to use	5.32	1.10
System use	4.64	1.04

Note. Adapted from (Motaghian et al., 2013).

The results suggested that information quality, service quality, subjective norm, and self-efficacy increased instructors' perceived ease of use of the web-based LMS (Motaghian et al., 2013). The highest mean found was of the construct of intention to use *(M* = 5.32), and the standard deviation *(SD* = 1.10) was similar to the standard deviations of the other variables associated with the study. The present study posited that a training intervention (the external variable) might increase behavioral intent to use new LMS tools among instructors.

Perceived Usefulness (Usefulness)

Perceived usefulness has been defined as "the degree to which an individual believes that using a particular system would enhance his or her job performance" (Davis, 1985, p. 82). End-users' intentions to use a new system are influenced largely by their perceived usefulness of the system, as supported in numerous empirical studies (Bagozzi et al., 1992). Perceived usefulness coupled with perceived ease of use were constructs used to develop the original measurement scales in 1989. These scales were often used during the 1990s to assess the likelihood of someone using new technological solutions, such as email and software for graphics creation (Hendrickson, Massey, & Cronan, 1993). Davis (1989) aimed to validate new scales for usefulness and ease by factor analyzing the scale items using principal component extraction and oblique rotation. The following six scale items were associated with usefulness with their associated factor loadings in parentheses: (a) work more quickly (.91), (b) job performance (.98), (c) increase productivity (.98), (d) effectiveness (.94), (e) makes job easier (.95), and (f) useful (.88). The results suggested favorable convergent, discriminant, and factorial validity of the usefulness of the construct (Davis, 1989), which supported the use of the usefulness construct for the present study. Instructors increase technology use in their teaching over time, primarily because they begin to perceive its usefulness by exploring the technology features or through discussions with colleagues or formal training sessions (Morgan, 2003).

Perceived Ease of Use (Ease)

Ease was defined as "the degree to which an individual believes that using a particular system would be free of physical and mental effort" (Davis, 1985, p. 82). Historically, instructors have made poor use of technology when teaching (Hixon & Buckenmeyer, 2009). The lack of technology use may be attributed to the lack of perceived ease of use of the technology solution. Like perceived usefulness, ease has been found to be a fundamental determinate of user acceptance (Davis, 1989). As stated earlier, the TAM may help to describe how users' beliefs and attitudes translate into behavioral intentions. Instructors who had to load and reload course materials from semester to semester disliked LMS use and this reloading had been found to be a factor that reduced LMS use among them. Other illustrations of a lack of perceived ease of use were systems that were found to be inflexible or overly structured (Morgan, 2003).

Attitude Toward Using (ATU)

Attitude toward using is the third construct that makes up the TAM. Attitude toward using may be linked to a willingness to use technology in the teaching process, and if the instructors' attitude is positive it should lead to adoption of the technology they are considering using (Aldunate & Nussbaum, 2013). Aldunate and Nussbaum (2013) found that early adopters and those who invested more time in learning technologies had a more positive attitude toward technology use. In their study, 38% of instructors were early adopters; however, attitude toward use was influenced by the complexity of the technology to be adopted.

Behavioral Intention to Use (Intent)

In the TAM, the construct depicted just before actual system use is intent. Behaviors help initiate one's actions and constitute the thought process or cognitive planning that results in actual use. Recent research by Schonenboom (2014) has suggested that high behavioral intention to use was statistically significantly correlated with both high LMS usefulness and high ease of LMS use. Conversely, low LMS intention was explained by low task importance, low task performance, low LMS usefulness, and low LMS ease of use (Schoonenboom, 2014). Schonenboom (2014) used the TAM to help explain why some instructors intend to use certain LMS tools more than other instructors. Perceived usefulness and ease influenced behavioral intent to use the technological tools, corroborating earlier research (Chen & Tseng, 2012; Lin & Chen, 2013; Motaghian et al., 2013). In a qualitative study, West et al. (2007) found that instructors' behavioral intention to use LMS features was driven by mandates from their supervisor, one or two features that appear to provide an efficiency gain, the convenience of online grading, and pressure from colleagues and students. There was no known mandate to use LMS at the university where the study took place; however, the treatment group may have found that new features on which they are trained were useful and behavioral intent to use may have been positively influenced. Training content associated with the Canvas® Speedgrader® also may have motivated instructors to change their behavioral intention to use the system.

Actual System Use (ASU)

Actual system use (ASU) is the final construct in the Technology Acceptance Model. To illustrate ASU, the entire model of constructs should be considered in context. TAM was derived from the Theory of Reasoned Action (Ajzen & Fishbein, 1980). In the TAM, external variables serve as primary inputs to two of the "main internal beliefs" (Wang & Wang, 2009, p. 762) of the model: perceived usefulness and perceived ease of use. Perceived ease has a direct effect on perceived usefulness and together the two constructs influence attitude toward use. Attitude toward use effects behavioral intention to use, and finally with intention to use realized by the system user, actual system use then occurs (Wang & Wang, 2009). Additional research to extend the findings of the present study might measure actual system use.

TAM 2 and TAM 3: Continuations of TAM

The TAM model was adapted and extended at least two times. Limitations within the TAM were highlighted by Venkatesh and Davis (2000), who conceptualized a modified model. Venkatesh and Davis (2000) characterized the limitations as a lack of evidence as to why an individual may perceive a system as useful. Therefore, new constructs including job relevance, output quality, and result demonstrability were coupled with the existing construct of ease and were intended to measure the influence of cognitive process on usefulness (Venkatesh & Bala, 2008). In addition to the new variables, the researchers examined how the model worked in mandatory environments, given that the model had been used previously only to research adoption of technology in optional situations.

The TAM 3 was conceptualized as a continuation of the TAM 2 and was created to test three new relationships of relevant constructs including ease to usefulness, computer anxiety to ease, and ease to intent (all moderated by experience; Venkatesh & Bala, 2008). Determinates of ease were listed in the TAM 3 as computer self-efficacy, perception of external control, computer anxiety, computer playfulness, perceived enjoyment, and objective usability. Perceived ease of use to usefulness suggests that computer-system users' perceptions will increase as their exposure to the system increases. User's interpretations of their experiences help to determine further system use. Computer anxiety to ease posits that experience with the new technology will moderate the effect of anxiety on ease, eventually to the point of dissemination (of the anxiety). Perceived ease of use to intent indicates that experience will moderate the effect of ease on intent as procedural knowledge increases (Venkatesh & Bala, 2008). Perceived ease of use is an initial barrier that usually decreases as the end user becomes familiar and accustomed to the computer system. In summary, hands-on experience helps to increase perceived ease of use and consequently behavioral intent to use the system (Venkatesh & Bala, 2008).

Evaluation of the effectiveness of the TAM has been done through empirical research including several meta-analyses. A 2007 meta-analysis investigated the TAM based on subjective norms and included 51 articles in the analysis. The quantitative approach attempted to further clarify the role of subjective norms in association with technology acceptance. Three constructs were used to guide the research-study approach including the type of respondents used in the reviewed studies, the type of technology that was used, and the contingency factor of culture associated with the studies included in the meta-analysis (Schepers & Wetzels, 2007).

Results of the meta-analysis study suggested that students used as participants in a research study worked well with the model; this success was attributed to the strong level of homogeneity of a student population when compared with a nonstudent population. Technology was found to strongly moderate relationships within the model, this finding aligned with other research that suggested that 40% of user intention to use (the system) was explained by habit (Schepers & Wetzels, 2007).

Summary

The literature review was categorized into three germane sections. The purpose of the present study was to investigate how training and professional development effects university-level instructors' intent, ease, self-efficacy, frequency, and usefulness of audio- or video-based and speech-to-text-recognition technologies using either multimedia-or nonmultimedia-oriented approaches to provide feedback to students in college-level teaching.

A description of how multimedia is used successfully in the feedback and assessment process revealed that the modality of feedback effected students' perceptions of both the process of revising their work and of their relationships with their instructors (Silva, 2012).

The technology acceptance model (TAM) has been used widely for research related to Internet and technology use and information-systems-related research (Burton-Jones & Hubona, 2006; Chuttur, 2009; King & He, 2006) and has been characterized as the most widely used tool for research similar to the present study (King & He, 2006).

Technology acceptance model usage also has increased from a rate of four studies per year from 1998 to 2001 to 10 studies per year in 2003 and 2004 (King & He, 2006).

Finally, technology training for instructors was presented as it may effect instructors' attitudes related to the use of multimedia for the provision of feedback to students. The present study aimed to add to the knowledge-base findings that helped to characterize instructors' intent, ease, self-efficacy, frequency, and usefulness of audio- or video-based technologies as the university where the study was conducted had implemented a LMS that allowed for audio- or video-based feedback. With opportunities for training and professional development usage among instructors should increase as perception of self-efficacy increases along with perceived usefulness, perceived ease of use, and behavioral intent to use.

CHAPTER III

METHODOLOGY

The purpose of the study was to investigate how training and professional development affected university-level instructors' behavioral intent to use (intent), perceived ease of use (ease), perception of self-efficacy (self-efficacy), frequency of use (frequency), and perceived usefulness (usefulness) of audio- or video-based and speech-to-text-recognition technologies associated with the feedback and assessment process in college-level teaching. Multimedia-based Canvas® learning management system (LMS) tools including audio- or video-based feedback and speech-to-text-recognition were taught to the treatment group. The comparison group completed a Canvas® course that covered basic LMS functions. The research design, sample, protection of human subjects, research questions, instrumentation, and plan for a pilot study of the instruments are given in this chapter. Also, procedures for data collection and data analysis are presented.

Research Design

A pretest-posttest design was implemented with two groups of instructors at a private university in Northern California. The groups constituted a convenience sample and were populated through enrollment into the two Canvas® training classes that were used as treatment and comparison groups for the study. The independent variable was the level of training provided to the instructors: LMS class in basic functions and LMS class on advanced multimedia tools. The dependent variables were the responses to instructors' intent, ease, self-efficacy, frequency, and usefulness of use of either multimedia-based or nonmultimedia-based Canvas® LMS feedback tools.

Participants

This section begins with a description of the demographic information related to all instructors at the university where the present study took place. Demographics associated with the present study participants are then described.

The convenience sample for the present study included 60 instructors at the university who had enrolled in either the "Canvas® Essentials" or "Canvas® Feedback and Assessment" training courses. Of the 60 participants who completed the premeasure, four instructors from each group dropped out of the study; resulting in an overall response rate of 86% (26 participants remained in each group). It is unknown why the eight participants elected not to complete the postmeasure questionnaire.

In the Spring of 2015, 31% of full-time instructors at the university were full professors, 29% were associate professors, 36% were assistant professors, and 5% were classified as instructors. The gender of full-time faculty was 51% male and 49% female. The breakdown of part-time faculty's genders was 43% men and 57% women. The university employed 459 full-time and 651 part-time faculty members.

Training for the present study took place through the Center of Instruction and Technology (CIT) within the University. All of the instructors at the University had access to the University's LMS (Canvas®). If desired, instructors may have used the Media Comment Tool contained within the Rich Content Editor to provide audio- or video-based feedback to their students. All participants (n = 52) completed 10 questions measuring demographics. Table 5 contains the distribution of gender for all participants.

Table 5

Distribution of Gender for Participants Broken Down by Group

	Treatment (*n*=26)		Comparison (*n*=26)	
Gender	*f*	%	*f*	%
Male	10	38.5	9	34.6
Female	16	61.5	17	65.4

The teaching status of the participants was gauged by four choices: (a) tenured, (b) tenure-track, (c) term, and (d) adjunct. There was much less representation of tenured or tenure-track instructors than there were term and adjunct instructors, and adjunct instructors represented 38% of both the treatment- and comparison-group populations. See Table 6 for the distribution of teaching status for all instructors who participated.

Table 6

Distribution of Teaching Status for Participants Broken Down by Group

	Treatment (*n*=26)		Comparison (*n*=26)	
Teaching Status	*f*	%	*f*	%
Tenured	8	30.8	2	7.7
Tenure-Track	2	7.7	4	15.4
Term	5	19.2	10	38.5
Adjunct	10	38.5	10	38.5
Other	1	3.8	0	0.0

Participants' ages ranged from 23 to over 70 in the study, and over 50% of participants in each group were in the 50 to 70 age range, resulting in a population that was lacking in younger instructors. The distribution of age for participants is found in Table 7.

Table 7

Distribution of Age for Participants Broken Down by Group

	Treatment (*n*=26)		Comparison (*n*=26)	
Age Range	*f*	%	*f*	%
23-29	0	0.0	2	7.7
30-39	1	3.8	4	15.4
40-49	4	15.4	6	23.1
50-59	10	38.5	5	19.2
60-69	9	34.6	9	34.6
70+	2	7.7	0	0.0

Teaching modalities for participants were largely face-to-face (F2F), and there were more participants who taught blended (a combination of modalities) than those who taught solely online. Table 8 has the distribution of teaching modality for all participants.

Table 8

Distribution of Teaching Modality Broken Down by Group for Participants

	Treatment (*n*=26)		Comparison (*n*=26)	
Modality	*f*	%	*f*	%
F2F Classroom	22	84.6	20	76.9
Online	1	3.8	0	0.0
Blended	3	11.5	6	23.1

The majority of treatment-group participants taught at the undergraduate level and the majority of comparison-group participants taught at the graduate level. One participant taught at the doctoral level. See Table 9 for breakdown of teaching levels.

Table 9

Distribution of Teaching Level for Participants

	Treatment (*n*=26)		Comparison (*n*=26)	
Teaching Level	*f*	%	*f*	%
Undergraduate	19	73.1	10	38.5
Graduate (Masters)	6	23.1	16	61.5
Graduate (Doctoral)	1	3.8	0	0.0

About 40% of treatment-group participants had over 20 years teaching experience.

Table 10

Distribution of Number of Years Teaching for Participants Broken Down by Group

	Treatment (*n*=26)		Comparison (*n*=26)	
Teaching Years	*f*	%	*f*	%
0-2	0	0.0	6	23.1
3-5	2	7.7	4	15.4
6-10	3	11.5	7	26.9
11-15	5	19.2	4	15.4
16-20	3	11.5	2	7.7
21-25	9	34.6	0	0.0
26+	4	15.4	3	11.5

The level of experience for the treatment group (50% over 20-years' experience) was greater that the comparison group's experience (11.5% over 20-years' experience).

Four different areas of the university were represented in the participant population. Participants from the College of Arts and Sciences are represented by more than 50% of the participant population in both groups. The second largest college represented was the School of Management with 15% of the total participant population. Table 11 has the distribution and frequencies of colleges for both the treatment and comparison groups.

Table 11

Distribution of Teaching College for Participants Broken Down by Group

	Treatment (*n*=26)		Comparison (*n*=26)	
Teaching College	*f*	%	*f*	%
College of Arts and Sciences	15	57.7	12	46.2
School of Education	2	7.7	8	30.8
School of Management	5	19.2	3	11.5
School of Nursing and Health Professions	4	15.4	3	11.5

Four university campuses were represented among study participants. The study was conducted at the main campus (80% of study participants taught at that campus). Participants who did not teach at the Hilltop campus travelled to the main campus to participate in the study. Some participants were already on the main campus for new-hire onboarding which was held at the beginning of each semester. New-hire onboarding offered various activities including Canvas® LMS training and the opportunity to participate in the present study. See Table 12 for the distribution of participants' assigned university campuses including frequencies and percentages.

Table 12

Distribution of Campuses Taught for Participants Broken Down by Group

	Treatment (*n*=26)		Comparison (*n*=26)	
Campus	*f*	%	*f*	%
Main	23	88.5	22	84.6
Downtown	1	3.8	2	7.7
Extension	0	0.0	1	3.8
Branch	2	7.7	1	3.8

Forty percent of participants had completed a previous Canvas® training class and were largely in the treatment group. Canvas® was launched in 2008 and is an intuitive and user friendly application. For this reason, instructors were permitted to enroll in the advanced class without having completed the basics course. Other participants reported that they had taken an online class or obtained materials from the CIT website, and 85% of the comparison group had not completed previously a Canvas® training class. See Table 13 for the distribution and frequencies of previous Canvas® training completed for both groups.

Table 13

Distribution of Previous Canvas® Training Completed for Participants Broken Down by Group

	Treatment (*n*=26)		Comparison (*n*=26)	
Training Completed	*f*	%	*f*	%
Taken a classroom training at the university	18	69.2	3	11.5
Taken an online training from the university	1	3.8	0	0.0
Obtained materials from CIT website	1	3.8	1	3.8
Not previously taken Canvas® training	6	23.1	22	84.6

Participants were asked how often they preferred to take Canvas® training. The frequencies were similar with about 35% stating that one class would suffice, 20% of participants desired one class per semester, and about 30% desired one Canvas® training per year. Table 14 has the breakdown of training preferences for each group of the study.

Table 14

Distribution of Training Frequency Preferences for Participants Broken Down by Group

	Treatment (*n*=26)		Comparison (*n*=26)	
Training Preference	*f*	%	*f*	%
One training course only	7	26.9	11	42.3
A course per semester	5	19.2	6	23.1
A course twice per semester	10	38.5	1	3.8
A course once per year	3	11.5	7	26.9
Training would not increase likelihood	1	3.8	1	3.8

In summary, the demographics of both groups were represented among different preferences and diversities; however, a large percentage of the population had extensive teaching experience (over 20 years). The treatment and comparison groups were not well divided between teaching undergraduate and graduate students; there were many more undergraduate instructors in the treatment group.

Protection of Human Subjects

Protection of human subjects is governed by Standard 8: Research and Publication (American Psychological Association, 2012). Institutional approval for the pilot and present study was received from the University of San Francisco Institutional Review Board for the Protection of Human Subjects (IRBPHS). Informed consent was obtained from each research participant as they logged into the questionnaire. Consent was assumed based on completion of the premeasures questionnaire, and questionnaire responses remained anonymous. The rights and confidentiality of research participants were protected, and they were notified that they could withdraw from the research study at any time without consequence. See Appendix E for a copy of the letter of the invitation.

Only the researcher and had access to the response data. The data downloaded from the electronic program were stored on the researcher's laptop computer in a folder on the desktop locked with a passcode for entry. When not in use, this laptop was locked to a docking station on top of the researcher's desk. Any data collected by the electronic program such as user IDs or Internet Protocol (IP) addresses that could lead to identification of the participants was masked electronically by the program application. To make comparisons between pre- and postdata, the Qualtrics tool was set up with a function entitled "panels" that required the respondent to enter a code to begin the postmeasures questionnaire. The code was created by the participant when completing the premeasures questionnaire.

Each instructor who participated in the study was offered a Target gift card as compensation. Also, one participant won an iPad Mini 2 (16gig, Wi-Fi enabled). The winner was chosen through a random drawing. Each time a participant completed a questionnaire either pre or post, they were entered into the drawing.

Access to instructors as participants was approved by the director of the Center of Instruction and Technology within the university and by the Online Instructional Designer who teaches Canvas® classes at the university.

Instrumentation

Among organizations that use learning management systems, usage-related research questionnaires have often been used to measure instructors' preferences and intentions (Ajjan & Hartshorne, 2008; Burton-Jones & Hubona, 2006; Davis, 1985).

These questionnaires have measured perceived usefulness, perceived ease of use, attitude toward using, and behavioral intention to use new LMSs; however, no instrument regarding audio or video feedback directly associated with the Canvas® LMS was found, therefore, questionnaire items measuring the audio- or video multimedia tools were added to the questionnaire for the present study.

Dependent variable identifiers were modified for the present study and are listed below in Table 15. Constructs that measured multimedia use include the word media after the name of the construct. Usefulness did not measure multimedia use. Questionnaire items were developed in relation to the study constructs and were based on the original Technology Acceptance Model questionnaire (Davis, 1989), the Ervin (2013) dissertation, and items written by the researcher. Items were modified to meet the intentions of the study and were comprised of Likert-type, frequency, and self-efficacy scale ratings.

Table 15

Constructs and Questionnaire Items

Construct	Item Numbers	Number of Items
Intent	Q2, Q27, Q29	3
Intent Media	Q25, Q26	2
Ease	Q7, Q13, Q16, Q32, Q33	5
Ease Media	Q14, Q15, Q30, Q31	4
Self-efficacy	Q11, Q12, Q28*	5
Self-Efficacy Media	Q8, Q9, Q10	3
Frequency	Q3*	4
Frequency Media	Q3_4, Q3_5	2
Usefulness	Q5*, Q17, Q18, Q19, Q20, Q21, Q22, Q23, Q24	13

* Underscores indicate multipart questions.

Higher means indicated stronger agreement with the construct. Items were measured using a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*) for all variables except for self-efficacy and self-efficacy (media) that were measured using a 5-point scale ranging from 1 (*not skilled at all*) to 5 (*very skilled*). Responses to the items within each construct were summed and averaged to obtain the data for analysis purposes.

Validity

A pilot study of the questionnaire and training classes was conducted during the Spring of 2015 and validity was assessed. A panel of three experts who all teach in the School of Education were asked to complete a rubric to assess clarity, wordiness, negative wording, overlapping responses, balance, use of jargon, appropriateness of item responses, use of technical language, application, and relationship to the problem.

The panel suggested changes to questionnaire items that measured ease, usefulness, self-efficacy, and frequency. Changes were made to the instrument while the pilot study was in progress resulting in missing data for 12 questions (nine participants). To compensate for the nine cases of missing data, listwise deletion was incorporated into the reliability analysis for the constructs of ease, usefulness, self-efficacy, and frequency. Also, after the pilot test, the dependent variables (use, ease, self-efficacy, frequency, and intent) were divided in two based on whether the item was multimedia or not. Constructs that measured either multimedia or nonmultimedia as defined by the research questions.

Based on feedback and responses from the validity panel, revisions to the instrument were made and included the following: (a) increased clarity, (b) elimination of overlapping responses, (c) increased balance and use of a neutral tone, (d) increased appropriateness of responses, (e) enhanced relationship to the problem, (f) and clarification of demographics being asked. The revised questionnaire was then resent to the two remaining panel members who offered additional feedback. One panel member suggested a reduction in the number of questionnaire items from 34 to 15 and removal of the name of the university from the questionnaire. The other panel members then offered minor edits and completed the rubric. All responses were in the meets or exceeds expectations categories, and no responses were found in the below expectations or not acceptable categories. See Appendix A for the validity rubric that the expert panel completed.

Reliability

Reliability was tested twice using Cronbach coefficient alpha, once during the pilot study and again after collecting the premeasures data for the present study. Table 16 presents Cronbach coefficient alphas for items used in both the pilot study and the present study.

Table 16

Cronbach Coefficient Alpha by Construct for Pilot and Present Studies

	Pilot Study		Present Study	
Construct	Cronbach Coefficient Alpha	Number of Items	Cronbach Coefficient Alpha	Number of Items
Intent*	.64	6	.53	3
Intent Media	-	-	.89	2
Ease	.87	9	.67	5
Ease Media	-	-	.66	4
Self-Efficacy	.75	8	.71	5
Self-Efficacy Media	-	-	.86	3
Frequency*	.80	7	.68	4
Frequency Media	-	-	.91	2
Usefulness	.87	13	.85	13

*Indicates one question associated with the construct was removed from the study.

After collecting 60 cases of data during the present study, two questionnaire items were removed. From the construct of intent question one was removed bringing the Cronbach coefficient alpha value from .68 to .72; however after splitting the construct into intent and intent (media) reliability remained at .53 for intent. From the construct of frequency question three part-one was removed bringing the Cronbach coefficient alpha value from .63 to .68. No other items were removed for the data analysis. The division of constructs into multimedia and nonmultiemdia variables lowered reliabilities for some of the constructs. Changes were made to the questionnaire after the pilot including rewording of negatively worded question stems, removal of a "select all that apply" question, and ensuring that the questionnaire values were consistent across all questions.

Treatment Description

The study was designed with two different treatments. The comparison group participated in a Canvas® Essentials course that was considered a basics-level course and offered instruction on foundational tasks. The Canvas® Essentials course taught the following topics: (a) configuration of basic course settings, (b) upload of files to a file repository, (c) link a syllabus to a page, (d) configure a course homepage, (e) create an assignment, (f) grade an assignment, and (g) organize a course into modules.

The treatment group participated in a Canvas® Feedback and Assessment course that was considered an advanced-level course (when compared with the topics covered in the basics class). The Canvas® Feedback and Assessment course taught the following topics: (a) recording of audio-based feedback, (b) recording of video-based feedback, and (c) use of the speech-to-text-recognition feature.

Both the basics and the advanced courses lasted 2 hours and used technical-work instructions with screen shots and callouts as training materials, along with system demonstrations that were provided by the instructor. The participants were then provided with the opportunity to practice the skills using their own Canvas® account. Also, participants were provided with printouts of the training materials (see Appendixes C and D) and were allowed to take the materials with them after the class ended.

To recruit participants for the present study, instructors asked class enrollees if they were willing to participate in the research study upon the start of the Canvas® training class. If they agreed to participate, the premeasures questionnaire was administrated and took about 15 minutes to complete. Those who chose not to participate in the study were provided with training materials to review while others completed the questionnaire. The training was then administrated to all class enrollees regardless of participation in the study. Nearly all instructors who were asked to participate agreed to do so. There were no delineable differences between participants in the two different groups. Those who participated in the research study were then provided with a thank-you letter that explained that the postmeasures questionnaire would be emailed to them exactly 30 days later. A $15 Target gift was taped to the thank you letter and was distributed at the end of the training class.

Pilot Study for Treatment

The intent of the pilot study was to allow the researcher to assess the adequacy of the research instruments, the adequacy of the training materials, and the feasibility of the research study in general. The pilot study helped establish whether the sampling frame and techniques were effective.

The participants of the pilot study were instructors who taught at a private university located in Northern California. Teachers of all levels including instructor, assistant professor, associate professor, professor (not tenured), and professor (tenured) were invited to attend. Participants were required to be teaching currently at least one class to participate in the study.

The pilot study was conducted in a computer lab where Canvas® training typically takes place. Problems with technology or logistics were addressed during the pilot study and were then evaluated and assessed for improvements prior to the actual study. The pilot study also provided a chance for employees in the Center for Instruction and Technology (CIT) to practice administrating the questionnaire and the training class. Training content revisions were addressed and implemented upon conclusion of the pilot study.

The pilot study offered as many comparison and treatment sessions as was necessary to obtain 30 participants. Pilot-test participants were recruited through an email sent to University instructors by the director of the Canvas® training department, through an advertisement on the training class sign-up page, and through the regularly scheduled training classes that instructors self-enrolled in. Canvas® trainees who were not contacted previously were invited to participate in the research study upon arrival to the class. Teaching of the pilot study classes was done by the University Canvas® trainer and by the researcher. Both had extensive experience in the delivery of technical training classes.

Recoding of values in the instrument was necessary due to changes to some of the items during the pilot study. During the pilot study, Cronbach coefficient alpha values were strong and did not indicate the need for changes.

Procedures

The present study commenced August of 2015 and concluded in April of 2016. Both courses (Essentials and Feedback and Assessment) were offered in two ways. The first method that the course was offered was through a regular schedule of offerings. These offerings were posted to the Canvas® LMS online training calendar, and participants enrolled online. Both courses were offered 3 times per month. The second way participants took the courses was through the university's New Hire onboarding program. When the semester started, Canvas® LMS training was included as a part of the New Hire program, and instructors were invited to participate. The CIT training calendar mentioned the ongoing research study and stated that participants would receive a Target gift card if they participated and that one participant would win an iPad Mini (16 gig, wi-fi only). Some participants were invited to participate via email.

The pretest was administered prior to each Canvas® training class, and instruction began immediately thereafter, lasting 2 hours per class session. The posttest was administered 4 weeks after the training class to each participant. Thirty participants represented the treatment group, and 30 represented the comparison group. Due to limited resources, the study offered a trainer to teach the treatment class and a different trainer to teach the comparison group. Both trainers were employees of the Center for Instruction and Technology and shared an office. The comparison group was taught by the resident Canvas® LMS trainer, and the treatment group was taught by a student in the

School of Education who was pursuing a Master's degree in Education with a focus on digital technologies for teaching and learning.

Two elements of data were collected: (a) demographic information, including gender, age, years of teaching experience, primary teaching modality, university level of teaching, area of university, and previous experience attending Canvas® training and (b) intent, ease, self-efficacy, frequency, and usefulness of use of audio- or video-based LMS tools that use multimedia and those that do not use multimedia. Pre- and posttest data were collected using an electronic online survey tool. The electronic questionnaire was administered in the computer lab where the Canvas® training took place for the premeasure questionnaire and was delivered through email for the postmeasure questionnaire.

The treatment group participated in a newly developed Canvas® training class entitled Canvas® Feedback and Assessment that focused on the advanced functions in Canvas®. The comparison group participated in an existing training class entitled Canvas® Essentials and was considered to be a course that covers the basics of Canvas® use.

Research Questions

The methodology that was used to collect data for the present study was designed to answer two research questions:

1. To what extent is there a difference for each group in the change from pretest to posttest in instructors' behavioral intent to use (intent), perceived ease of use (ease), perception of self-efficacy (self-efficacy),

frequency of use (frequency), and perceived usefulness (usefulness) in the use of multimedia or nonmultimedia tools for the provision of feedback?

2. To what extent is the change from pretest to posttest on each of the dependent variables different for participants in the treatment and comparison groups?

Dependent variables were evaluated using items that measured either multimedia use or nonmultimedia use within the LMS with the exception of usefulness that only measured nonmultimedia technology use.

Data Analysis

A paired-samples *t* test was used on the scores from pretest to posttest to investigate differences for each group (treatment and comparison) on each of the dependent variables to address research question one. An independent-samples *t* test was used to investigate if the treatment and comparison groups differed from pretest to posttest on each of the change scores for the nine variables for the second research question. Means, standard deviations, and *t*-test results were presented. If there was statistical significance, an effect size was calculated. Higher means indicated stronger agreement with the construct. Finally, an additional analysis displayed the relationship between the categorical variables using cross-tabulation.

Summary

Sixty instructors from a private university in the San Francisco Bay Area participated in training designed to teach various Canvas® LMS functions. Instructors became part of the treatment group (n = 26) or the comparison group (n = 26) depending on if they enrolled in the Canvas® basics or Canvas® advanced classes. Four participant's data from each group were excluded; as they did not complete the postmeasures questionnaire (the even number of excluded participants between the two groups was coincidental). The research questions were developed to investigate the effects of either basic or advanced learning management system (LMS) training on the dependent variables previously listed. The study participants were grouped by treatment and comparison. The treatment group completed an advanced multimedia feedback training class entitled Canvas® Feedback and Assessment and the comparison completed a basic nonmultimedia training class entitled Canvas® Essentials. The Canvas® Feedback and Assessment course was conceptualized and written by the researcher.

The research was a three-step process. During the first step, the Canvas® trainer asked trainees who had enrolled in the training class to participate in the study. If the trainee agreed to participate, they then completed the premeasure questionnaire with 10 items measuring demographics and 42 items measuring nine different constructs (see Table 11 for a classification of questions in the constructs). In the second step of the process, either a 2-hour advanced Canvas® or a 2-hour Canvas® basics training was administered to the class. These classes served as the intervention for the study. The third step of the process involved the participants completing a postmeasures questionnaire that was administrated (via email) 30 days after the training. The postmeasures questionnaire had the same questions as the premeasure questionnaire but did not have demographic questions.

Data were collected over the course of two semesters that included Fall of 2015 and Spring of 2016, spanning about 7 months. Premeasure questionnaire were always completed right before the Canvas® training class started. Data were not collected during semester breaks or University intersession periods. One instrument was used in the study. The instrument was a 42-item questionnaire (two questions were discarded to increase reliabilities) that was developed by the researcher with inputs from existing instruments and from the original Technology Acceptance Model (TAM) items. Each item was associated directly with one of the nine dependent variables used for the study.

CHAPTER IV

RESULTS

The purpose of the study was to investigate how training and professional development affected university-level instructors' behavioral intent to use (intent), perceived ease of use (ease), perception of self-efficacy (self-efficacy), frequency of use (frequency), and perceived usefulness (usefulness) of audio- or video-based and speech-to-text-recognition technologies associated with the feedback and assessment process in college-level teaching.

Chapter IV contains an analysis of all scores relating to the research questions. Canvas® training classes served as the independent variable, and intent, ease, self-efficacy, frequency, and usefulness of multimedia and nonmultimedia tools for feedback in college-level teaching were the dependent variables. Qualitative results are reported as they relate to the two research questions.

This chapter begins with a preliminary analysis of the data using paired-samples *t* tests comparing change from pre-to-posttest for each group. Next, independent-samples *t*-test results that investigate any differences between the treatment and comparison group on the nine dependent variables from pre- to posttest are presented. Finally, an additional analysis displays the relationship between the categorical variables using cross-tabulation for three select questionnaire items measuring audio, video, and speech-to-text-recognition feedback.

Research Question One

To what extent is there a difference for each group in the change from pretest to posttest in instructors' intent, ease, self-efficacy, frequency, and usefulness of multimedia or nonmultimedia tools for the provision of feedback? Each dependent variable (excluding usefulness) was divided in two variables: one that measures nonmultimedia Canvas® LMS usage and one that measures multimedia-based feedback using Canvas® LMS. Basic or advanced Canvas® LMS training served as the independent variable.

After evaluating assumptions, paired-samples *t* tests were conducted on the nine dependent variables to compare the means of each group for change from pre- to posttest. Independence was met as the participants completed the questionnaires individually. Sample size was not large enough for the Central Limit Theorem to apply so there is a risk of a Type I error. When there was statistical significance, the effect size ranged from almost moderate to very large so such effects would indicate that a Type I error is not likely. The assumption of random assignment was not met due to the use of a convenience sample. Effect sizes for the paired-samples *t* tests were calculated using Cohen's *d*.

Mean measuring intent, self-efficacy, and usefulness indicated either agreement or strong agreement among both treatment and comparison groups; however, the variables of intent and usefulness resulted in little-to-no change in means from pretest to posttest. For the variable of self-efficacy, both group's means increased from pretest to posttest. Higher means indicated stronger agreement with the construct. Items were measured using a 4-point Likert-type scale for all variables except for self-efficacy and self-efficacy (media) that were measured using a 5-point Likert-type scale.

The variable of self-efficacy also resulted in a statistically significant change from pretest to posttest for both groups. Treatment-group participants' mean went up .41 of a point from pretest to posttest (Table 17) and had a strong effect (ES = .86), indicating that they were somewhat skilled at posttest. The comparison-group mean also reflected increased agreement in self-efficacy, participants reported that they were between not very skilled and somewhat skilled at using Canvas® LMS at pretest. At posttest the comparison-group's means indicated that they were above the somewhat skilled choice on the rating scale. The test was statistically significant with a very large effect size (ES = 1.25). Table 17 displays the means, standard deviations, paired-samples *t*-test results, and effect sizes for intent, self-efficacy, and usefulness.

Table 17

Pre- and Posttest Means, Standard Deviations, Paired-Samples *t*-Test Results, and Effect Sizes for Variables with High Agreement

		Treatment (n=26)				Comparison (n=26)			
Variable	Statistic	Pretest	Posttest	t (df=25)	*ES*	Pretest	Posttest	t (df=25)	*ES*
Intent	Mean	3.30	3.32	0.18	-	3.24	3.24	0.00	-
	SD	.59	.56			.48	.41		
Self-Efficacy	Mean	3.10	3.51	4.41*	0.86	2.55	3.19	6.40*	1.25
	SD	.92	.75			.65	.71		
Usefulness	Mean	2.89	2.90	0.13	-	2.83	2.86	0.28	-
	SD	.44	.39			.39	.38		

*Statistically significant when the overall error rate is controlled at the .05 level.

The dependent variables of intent (media), ease, ease (media), and frequency are all measured using a 4-point scale. For the four variables, means indicate that all participants are between agree and disagree both at pretest and at posttest.

For both groups, measuring the construct of intent (media) decreases slightly from pretest to posttest, and the results were not statistically significant (Table 18). Means for ease are higher at posttest for both groups; the paired-samples *t* test results in a statistical significance for the comparison group with a moderately strong effect size (ES = .72).

The variables of ease (media) and frequency resulted in higher means at posttest for both groups and are statistically significant for the four tests. Moderately strong effect sizes are present in the variable of ease (ES = .72) and for frequency among comparison-group participants (ES = .78). A strong effect is found for ease (media) among treatment-group participants (ES = .79), and a moderate effect for comparison-group participants (ES = .62). Higher means reflect stronger agreement with the construct. The means, standard deviations, paired-samples *t*-test results, and effect sizes for intent (media), ease, ease (media), and frequency are displayed in Table 18.

Table 18

Pre- and Posttest Means, Standard Deviations, Paired-Samples *t*-Test Results, and Effect Sizes for Variables with Medium Agreement

		Treatment (*n*=26)				Comparison (*n*=26)			
Variable	Statistic	Pretest	Posttest	*t* (*df*=25)	*ES*	Pretest	Posttest	*t* (*df*=25)	*ES*
Intent (Media)	Mean SD	2.48 .89	2.35 .78	-0.75	-	2.21 .68	2.08 .89	-1.02	-
Ease	Mean SD	2.78 .47	2.88 .48	0.72	-	2.45 .55	2.79 .52	3.71*	0.72
Ease (Media)	Mean SD	2.31 .49	2.69 .47	4.02*	0.79	2.06 .59	2.40 .58	3.17*	0.62
Frequency	Mean SD	2.35 .62	2.50 .61	2.10*	0.41	2.01 .62	2.48 .53	4.00*	0.78

*Statistically significant when the overall error rate is controlled at the .05 level.

The variables of self-efficacy (media) and frequency (media) have means that signify the lowest levels of agreement among the nine dependent variables (Table 19). The means for all of these variables are closest to strongly disagree. Self-efficacy (media) resulted in a large statistically significant effect (ES = 1.22), and the mean increased from pretest to posttest for treatment-group participants. Comparison-group participants have increased agreement from pretest to posttest for self-efficacy (media), and the change is statistically significant with a large effect (ES = .75).

Frequency (media) has decreased agreement from pretest to posttest among treatment-group participants (Table 19). Comparison-group participants' mean increased slightly from pretest to posttest. No paired-samples *t* tests resulted in statistically significant findings for the variable of frequency (media). Higher means reflect stronger agreement with the construct. Means, standard deviations, paired-samples *t* test results, and effect sizes for self-efficacy (media) and frequency (media) are given in Table 19.

Table 19

Pre- and Posttest Means, Standard Deviations, Paired-Samples *t*-Test Results, and Effect Sizes for Variables with Low Agreement

		Treatment (n=26)				Comparison (n=26)			
Variable	Statistic	Pretest	Posttest	t (df=25)	*ES*	Pretest	Posttest	t (df=25)	*ES*
Self-Efficacy (Media)	Mean	1.37	2.30	6.23*	1.22	1.19	1.69	3.85*	0.75
	SD	.51	.90			.50	.68		
Frequency (Media)	Mean	1.31	1.29	-0.21	-	1.17	1.21	0.42	-
	SD	.55	.53			.47	.49		

*Statistically significant when the overall error rate is controlled at the .05 level.

Research Question Two

To what extent is the change from pretest to posttest on each of the nine variables different for participants in the treatment and comparison groups?

Prior to calculating the independent-samples *t* tests, assumptions were evaluated. Independence was met as the participants completed the questionnaires individually. Sample size was not large enough for the Central Limit Theorem to apply so there is a risk of a Type I error. When there was statistical significance, the effect size ranged from almost moderate to very large so such effects would indicate that a Type I error is not likely. The assumption of random assignment was not met due to the use of a convenience sample. The assumption of homogeneity of variance was robust with respect to violation as there were equal numbers of participants in each group.

The results of the independent-samples *t* tests are divided into three parts. The first part discusses treatment-group results. The second part discusses comparison-group results, and the final part discusses findings with statistical significance.

Independent-samples *t* tests used the difference from pretest to posttest on each of the nine dependent variables. The treatment group reflected positive change from pre- to posttest in means on the following change variables: use, use (media), ease, frequency, frequency (media), and usefulness. All variables reflected positive change from pretest to posttest except for intent (media). Intent (media) had a negative change in means from pre- to posttest for both groups with a mean difference of -.13 (Table 20), which is not statistically significant.

Review of the means for the comparison group revealed low change in means to the intent, intent (media), ease, frequency, frequency (media), and usefulness variables. Negative change was observed for the variables of ease (media) and self-efficacy. Positive change was observed for the self-efficacy (media) variable signifying a large change from pre- to posttest.

Independent-samples *t* tests resulted in three statistically significant differences from pretest to posttest. The change for frequency was greater for the comparison group with the following effect size (ES = -.62). Change related to ease was greater for the comparison group than it was for the treatment group (ES = -.59). Change related to self-efficacy (media) was greater for the treatment than it was for the comparison group (ES = .58). The means, standard deviations, independent-samples *t*-test results, and effect sizes are presented in Table 20.

Table 20

Pre- and Posttest Differences in Means, Standard Deviations, Independent-Samples *t*-Test Results, and Effect Sizes for all Dependent Variables (*N*=52)

	Treatment (*n*=26)		Comparison (*n*=26)			
Variable	Change Mean	SD	Change Mean	SD	*t* (*df*=50)	*ES*
Intent	.01	.37	.00	.42	0.12	
Intent (Media)	-.13	.91	-.13	.67	0.00	
Ease	.06	.43	.34	.46	-2.21*	-.59
Ease (Media)	.37	.48	.35	.56	0.20	
Self-efficacy	.41	.48	.64	.51	-1.62	
Self-efficacy (Media)	.93	.77	.50	.66	2.19*	.58
Frequency	.15	.35	.46	.60	-2.33*	-.62
Frequency (Media)	-.02	.46	.04	.47	-0.45	
Usefulness	.01	.33	.02	.37	-0.12	

*Statistically significant when the overall error rate is controlled at the .05 level.

Additional Analysis

The final step of data analysis was to summarize the relationship between the numbers of times responses were selected for the self-efficacy (media) variable. Self-efficacy (media) was selected for the cross-tabular analysis because it contained multimedia-oriented questionnaire items that measured multimedia-use or intent to use, including feedback provided using audio, video, or speech-to-text-recognition. Cross-tabular analysis provides a detailed view into how many times each response was selected at pretest and at posttest and highlights the shift in selections for each item.

Cross-tabular analysis of the audio-to-audio responses for the treatment group revealed three relevant findings. First, at pretest no respondents indicated very skilled in the provision of audio-based feedback, but at posttest one person responded very skilled. Second, no respondents stated that they were skilled at providing feedback to students at pretest. At posttest, six respondents stated that they were skilled at providing audio-based feedback. Third, 16 respondents stated that they were not skilled at all in providing audio-based feedback to students at pretest, at posttest only four respondents stated that they were not skilled at all. Table 21 contains the cross-tabular analysis of the pretest and posttest use of audio responses.

Table 21

Cross-Tabular Analysis of Audio-to-Audio, Pretest-Posttest Participant Responses for the Treatment Group ($n = 26$)

	Posttest					
Response Pretest	Not Skilled at All	Not Very Skilled	Somewhat Skilled	Skilled	Very Skilled	Pretest Total
Not at All Skilled	4	8	1	3	0	0
Not Very Skilled	0	3	3	2	0	0
Somewhat Skilled	0	0	0	1	1	2
Skilled	0	0	0	0	0	8
Very Skilled	0	0	0	0	0	16
Posttest Total	4	11	4	6	1	26

Note. Please rate your skill level when using Canvas® to record an audio message for the student.

Cross-tabular analysis of the video-to-video responses for the treatment group revealed three relevant findings illustrating some movement in the direction of using video to provide feedback to students. First, at pretest no respondents stated that they were very skilled in providing video-based feedback to students. At posttest one respondent stated that they were very skilled, representing a 100% increase from pre- to posttest for that Likert-scale selection. Second, at pretest no respondents indicated that they were skilled in providing video-based feedback to students, at posttest four respondents were skilled, representing a 400% increase in respondent selection of that Likert-scale choice. Third, there was a 66% decrease in respondents selecting not at all skilled from pretest to posttest. Table 22 presents the cross-tabular analysis of the pretest and posttest Likert-scale responses related to video use.

Table 22

Cross-Tabular Analysis of Video-to-Video, Pretest-Posttest Participant Responses for the Treatment Group (*n* = 26)

	Posttest					
Response Pretest	Not Skilled at All	Not Very Skilled	Somewhat Skilled	Skilled	Very Skilled	Pretest Total
Not at All Skilled	6	8	2	2	0	0
Not Very Skilled	0	3	2	0	0	0
Somewhat Skilled	0	0	0	2	1	3
Skilled	0	0	0	0	0	5
Very Skilled	0	0	0	0	0	18
Posttest Total	1	4	4	11	6	26

Note. Please rate your skill level when using Canvas® to record a video message for the student.

Cross-tabular analysis of the speech-to text-recognition responses for the treatment group revealed three findings of interest illustrating some movement in the direction of using the speech-to-text-recognition feature to provide feedback to students. First, at pretest no respondents selected skilled, but at posttest three respondents indicated that they were skilled. The same was true for the Likert-scale choice of somewhat skilled. The largest shift in participant responses was associated with the not skilled at all Likert-scale choice. At pretest, 20 respondents reported that they were not skilled at all, and at posttest only nine participants selected that choice, representing a nearly 50% shift up the Likert-scale toward very skilled. See Table 23 for cross-tabular analysis of the pretest and posttest Likert-scale responses related to video use.

Table 23

Cross-Tabular Analysis of Speech-to-Text-Recognition, Pretest-Posttest Participant Responses for the Treatment Group (*n* = 26)

	Posttest					
Response Pretest	Not Skilled at All	Not Very Skilled	Somewhat Skilled	Skilled	Very Skilled	Pretest Total
Not at All Skilled	0	0	0	0	0	0
Not Very Skilled	0	0	0	0	0	0
Somewhat Skilled	0	0	0	0	0	0
Skilled	0	1	1	2	2	6
Very Skilled	0	2	2	9	7	20
Posttest Total	0	3	3	11	9	26

Note. Please rate your skill level when using Canvas® to use the "speech-to-text-recognition" feature.

Summary

Data were analyzed using three statistical methods. The first step was a preliminary approach using paired-samples-*t* tests of the treatment and comparison group's data to evaluate if there were any changes on the pretest and posttest questionnaire. The second statistical method was to conduct independent-samples *t* tests to compare differences from pretest to posttest on each of the nine variables for those in the treatment and comparison groups separately. The third step was to summarize the relationship between the numbers of times responses were selected for the self-efficacy (media) variable using cross-tabular analysis. This section provides the findings for each statistical procedure.

A review of the paired-samples *t*-test data resulted in the following findings. First, the dependent variables of intent, self-efficacy, and usefulness resulted in the highest levels of agreement among both treatment and comparison groups. Among the three variables, self-efficacy has statistically significant results for both groups.

Means that ranged near the middle of the 4-point scale were found for the variables of intent (media), ease, ease (media), and frequency. Among the comparison group, statistically significant findings were found for the variables of ease, ease (media), and frequency. Within the treatment group, the paired-samples *t* tests result in statistically significant findings for the variables of ease (media) and frequency. Means increased from pretest to posttest for ease and frequency among treatment-group participants. Means increased for ease, ease (media), and frequency among comparison-group participants.

Minimal amounts of agreement were observed for the variables of self-efficacy (media) and frequency (media). Self-efficacy (media) results in statistical significance for both groups, and the effect size for treatment group participants is very large (ES = 1.22). The effect for the comparison group also is large (ES = .75). Means increase from pretest to posttest for self-efficacy (media) for both groups. Means remain nearly the same across both groups for the variable of frequency (media).

After reviewing the paired-samples *t*-test results, analysis was conducted on the data using independent-samples *t* tests. A review of the independent-samples *t* tests resulted in six findings. First, there were no statistically significant differences for either group for the intent and intent (media) variables. Second, ease means increased from pretest to posttest and were statistically significant (ES = -.59), indicating that the comparison group changed more than the treatment group. Third, the comparison group had a larger mean change than the treatment group for the variable of self-efficacy.

Fourth, self-efficacy (media) resulted in a statistically significant difference from pretest to posttest, and the mean change for the treatment group was much larger than the mean for the comparison group. Fifth, frequency resulted in statistically significant difference from pretest to posttest indicating a large decrease in frequency for both groups but larger for the comparison group (ES = -.62). Last, no statistically significant differences were observed for the variables of intent (media) or usefulness.

The last approach to data analysis was to use cross-tabular analysis to investigate the relationship between the numbers of times an item response changed from pretest to posttest for the variable of self-efficacy (media) to learn if the selections shifted toward increased perception of value or intent use either multimedia or nonmultimedia technology. The cross-tabular analysis resulted in five findings. First, for two of the three questions (audio and video), one respondent did not respond very skilled at pretest but responded very skilled at posttest. Second, for all three questions, no respondents reported being skilled at pretest. At posttest six respondents reported being skilled to use audio for feedback, four respondents reported being skilled to use video for feedback, and three respondents reported being skilled to use the speech-to-text-recognition feature for feedback purposes. Third, the use of audio for feedback purposes item resulted in some positive shift from pre to post with 12 fewer respondents selecting not skilled at all at posttest. Fourth, 12 fewer respondents selected not skilled at all at posttest than at pretest. Last, 11 fewer respondents selected not skilled at all at posttest than at pretest.

Chapter V contains the discussion of the results, limitations of the study, implications to practice, and suggestions for future research based on the findings and lessons learned from the study.

CHAPTER V

SUMMARY, LIMITATIONS, DISCUSSION, AND IMPLICATIONS

The purpose of the present study was to investigate how training and professional development effects university-level instructors' intent, ease, self-efficacy, frequency, and usefulness of audio- or video-based technologies using either multimedia or nonmultimedia technologies to provide feedback to students in college-level teaching. Chapter V includes a summary of the study and its findings, a discussion of the study limitations, a discussion of the study findings, implications for research, and implications for practice.

Summary of Study

The two most common infrastructure choices used in university-level learning are the learning management systems (LMS) and e-Learning. Weaver, Spratt, and Nair (2008) described the growth of LMS use from 1998 to 2008 as enormous, and since 2006, more than 95% of universities have used a LMS (Little-Wiles, Hundley, Worley, & Bauer, 2012; Woods, Baker, & Hopper, 2004). The use of technology in education has been characterized as ubiquitous (Shih & Chuang, 2013), and empirical research has found that, when used properly, technology has had a positive effect on student outcomes (Hicks & Hicks, 2006; Schrum et al., 2007). Coupled with the fact that feedback and assessment is a critical step in the teaching and learning process, multimedia feedback can help to bridge the gap between student and instructor, establish rapport between the two, and guide students as they develop resulting in better performance in their professional lives (Kashif, ur Rehman, Mustafa, & Basharat, 2014). Increased use of multimedia by instructors can bridge the generational gap between instructors who are not well versed in technology use and students who are accustomed to using technology in their day-to-day lives including their schooling.

Research typically has focused on learners and what learners indicate that they need; however, researchers also have investigated how and why instructors use different LMS features. The findings associated with this type of research have suggested that that nearly half of the instructors use almost none of the features available to them (Malikowski, 2008). Additional research has suggested that few instructors chose to use systems available to them (such as LMS) even though some reported that the system could improve student outcomes and interaction with their instructors (Ajjan & Hartshorne, 2008).

Although a large amount of research has been conducted on LMS usage, less is known about multimedia-based feedback such as audio, video, and speech-to-text-recognition-generated feedback. Lin, Atkinson, Christopherson, Joseph, and Harrison, (2013) suggested additional research focusing on feedback modality (text versus audio were highlighted) because the type of feedback provided may have an effect on learning outcomes, motivation, and cognitive load of the students. The present study was designed to address a gap in literature by investigating how training and professional development effected university-level instructors' intent, ease, self-efficacy, frequency, and usefulness of audio- or video-based technologies including multimedia-oriented and nonmultimedia-oriented technologies associated with the feedback and assessment process in college-level teaching.

The present study investigated how new feedback techniques might be adopted after treatment-group participants completed an advanced multimedia-based training class and comparison-group participants completed a basic nonmultimedia-oriented training class. The independent variable used for the study was an advanced Canvas® Feedback and Assessment class that the treatment group completed and a basic Canvas® Essentials class that the comparison group completed. Four dependent variables were divided based on whether the questions were based on the use of multimedia technology or not that resulted in eight variables. Therefore, the dependent variables used for the study were intent, intent (media), ease, ease (media), self-efficacy, self-efficacy (media), frequency, frequency (media), and usefulness (usefulness did not have a companion multimedia variable.)

The present study used the original Technology Acceptance Model (TAM) as the theoretical framework from the Davis (1989) study and also included some of the original questionnaire items. Other items were written by the researcher for the purposes of the study. The goal was to learn if training on multimedia-oriented feedback tools would increase instructor's intent, ease, self-efficacy, and frequency of both multimedia and nonmultimedia and usefulness of Canvas® LMS tools.

The present study was unique in that no existing research focusing on the Canvas® LMS audio-feedback, video-feedback, and speech-to-text-recognition-generated features were located. The need for the present study was identified by the lack of existing research and a need among the academic community to better understand university-level instructors' attitudes and skill levels in the provision of multimedia-based feedback to students.

The training classes used as interventions for the treatment and comparison groups were based on an existing basic Canvas® LMS training class that was used for the comparison group. A second advanced class was conceptualized and written by the researcher to serve as the intervention for the treatment group. The content of the newly-designed advanced features of LMS class included how to use three multimedia-based feedback tools including audio-feedback, video-feedback, and a speech-to-text-recognition-generated feedback. The comparison group was not taught how to use the advanced multimedia-based tools but was taught the basics of the Canvas® LMS.

A study was completed and was guided by the following research questions.

1. To what extent is there a difference for each group in the change from pretest to posttest in instructors' behavioral intent to use (intent), perceived ease of use (ease), perception of self-efficacy (self-efficacy), frequency of use (frequency), and perceived usefulness (usefulness) in the use of multimedia or nonmultimedia tools for the provision of feedback?
2. To what extent is the change from pretest to posttest on each of the dependent variables different for participants in the treatment and comparison groups?

Dependent variables were evaluated using items that measured either multimedia use or nonmultimedia use within the LMS with the exception of usefulness that only measured nonmultimedia technology use.

At the start of the present study, the creators of Canvas® LMS recently added the three multimedia-based functions (audio feedback, video feedback, and speech-to-text recognition). The sample consisted of 52 instructors from a private university in the San Francisco Bay Area. The study treatment offered two 2-hour Canvas® training classes on LMS usage. The class used for the comparison group was considered a basics course and did not offer instruction on how to use the multimedia-based feedback functions. An advanced class that did offer instruction on how to use the multimedia-based feedback functions was taught to the treatment group. A 42-question pre- and postquestionnaire was developed and included items that measured agreement with the dependent variables used for the study.

Data were analyzed in accordance with the research questions and was a three-step process. First, paired-samples *t* tests were conducted for each group to compare any differences in means for change from pre- to posttest. Second, independent-samples *t* tests were calculated to investigate any differences between groups for the nine dependent variables from pre- to posttest. Finally, additional analysis displayed the relationship between the categorical variables using cross-tabulation for the questionnaire items that measured audio feedback, video feedback, and speech-to-text-recognition preferences among participants.

Summary of Findings

Eighteen paired-samples *t* tests were calculated on the nine dependent variables (one test for each group) and resulted in nine statistically significant findings. Ease was found to be statistically significant for the comparison group, and means indicated a small increase in perceived ease of use of nonmultimedia technology for the purposes of feedback. Ease (media) was statistically significant for both groups, and the treatment-group had a greater change (ES = .62), a large effect that was expected as the treatment group was trained on the multimedia-based tools. Self-efficacy and self-efficacy (media) were statistically significant for both groups. The effect sizes for the two variables were large or very large and ranged from 0.75 to 1.25. Frequency was found to be statistically significant for both groups, and frequency (media) and usefulness were not.

Nine independent-samples *t* tests were calculated using change scores (the differences from pretest to posttest) for both groups. Of the three statistically significant findings, negative effects were observed for ease (ES = -.59) and frequency (ES = -.62) indicating that the comparison group had the greater change. The only positive effect was for the variable of self-efficacy (media) (ES = .58), indicating that the treatment group had the greater change. Because of the positive effect for self-efficacy (media) cross-tabular analysis was conducted on that variable.

The cross-tabular analysis of self-efficacy (media) revealed movement from the not at all skilled Likert-scale choice to somewhat skilled or skilled for the three questions that addressed the multimedia-feedback-use questions (use of audio, video, or speech-to-text recognition). There were two respondents who reported that they were very skilled in the use of the multimedia-oriented tools postintervention. Those participants had not selected very skilled at the pretest.

Limitations

The study had several limitations. First, the present study consisted of voluntary participation and was limited by the purposeful selection of instructors at one university. A more heterogeneous sample of participants would include instructors from additional universities. For example, generalization of the study results could be made to a defined geographical area such as the West coast of the United States if universities from Seattle to San Diego were included. The population of participants may be too narrow for generalization of the results to a population outside of the university where the study took place.

The second limitation to the study was the researcher. Researcher bias was possible because the researcher had been working with technical training, LMSs, and audio or video for over 12 years. All attempts to minimize bias were employed; however, bias could have manifested itself without the researcher knowing.

Participants of the study were all instructors at the same university using the same LMS. They all had access to the training classes offered by the Center for Instruction and Technology and could have received either formal scheduled training or personal assistance from the Online Instructional Designer who supported all instructors teaching at the University.

Forty percent of participants reported that they had taken a Canvas® training previously indicating different levels of previous experience among participants. A more homogeneous population may have increased the reliability of the findings.

Discussion of Findings

This section begins with a discussion of findings that resulted in the highest levels of agreement with the constructs and then presents findings of medium-level agreement. The section concludes with a discussion of findings that resulted in the lowest level of agreement among participants.

An analysis of the means for intent, self-efficacy, and usefulness revealed the most confidence among the study variables for both treatment- and comparison-group participants. The results of the present study support intent for both groups as evidenced by the participant's enrollment in Canvas® training class; however, the lack of change in means from pretest to posttest may have been due to a lack of time to try the new tools, as posttest data were collected 30 days after the training classes were administrated. Means for intent do not change from pre- to posttest for both groups, and participants rate themselves in-between agree and strongly agree at both times of data collection. Means for usefulness also do not change from pre- to posttest; participants are between disagree and agree (very close to agree) regarding their perception of usefulness of the LMS feedback tools. Variables external to the TAM such as subjective norms, image, job relevance, and output quality all may influence instructor's perception of usefulness, and it is possible that instructors with more teaching experience may value these external variables more than others with less experience (Chuttur, 2009).

Means for self-efficacy are higher at posttest for both groups, the treatment group rate themselves near strongly agree, and the comparison group agrees that they are self-efficacious in using Canvas® LMS basic functions. A 2006 meta-analysis on the use of the technology acceptance model (TAM) for research purposes suggests that there are not vast differences in intent and usefulness (King & He, 2006); a finding that is consistent with the results of the present study. Additional research that investigated if the TAM predicts actual use suggested that perceived usefulness is unlikely to correlate with actual usage (Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). Actual usage is not the same as intent but the constructs are similar enough to infer that the results of the present study are consistent with the Turner et al. (2010) finding.

Means for intent (media), ease, ease (media), and frequency revealed that instructors are somewhat confident both at pretest and at posttest. The variable of intent (media) was not statistically significant, and means from pretest to posttest went down for both groups; however, there may not have been sufficient time between pretest and posttest for intent to increase among participants. Intent has better predicted actual usage than other TAM variables (King & He, 2006; Turner et al., 2010) such as ease that has been found to have strong direct effects on intent (Al-Gahtani, 2016). Ease indicates a small increase in use of nonmultimedia technology for the purposes of feedback. Means measuring ease increased from pretest to posttest for both groups and was statistically significant only for the comparison group with a moderately strong effect size (ES = .72). The comparison group was taught by an experienced Canvas® LMS instructor, and the increase in perceived ease of use may be explained by the quality of instruction received. The treatment group was taught by a student in the School of Education who was pursuing a Master's degree in Education with a focus on digital technologies for teaching and learning.

Ease (media) resulted in statistically significant and practically important changes from pretest to posttest for both groups. The treatment group's effect size (ES = .79) is higher than the comparison group's (ES = .62) indicating that instructor's perceptions of ease of use of multimedia-based technology has increased after training. Research from 2006 has suggested that ease is more important to those using technology in an Internet-based environment (King & He, 2006), and the Canvas® LMS is Internet based.

Frequency means were in the disagree range and increased from pretest to posttest for both groups. Paired-samples *t* tests result in statistical significance for both groups with a low effect size for the treatment group (ES = .41) and a large effect size for the comparison group (ES = .78). Sixty-five percent of study participants are in the 50 to 70 age range, and it is possible that the age demographic factored into the low confidence among treatment-group participants for frequency of advanced technology features post-intervention. Thirty percent of the participant population has over 20 years of teaching experience and may be comfortable in their habitual teaching and feedback methods leading to reluctance to change.

The lowest levels of agreement among the dependent variables were found for the variables of self-efficacy (media) and frequency (media). Means were low at pretest (strongly disagree) for self-efficacy (media) but did increase posttreatment, and the changes were statistically significant for both groups. A very large effect size was observed for the treatment group for self-efficacy (media) suggesting that participants are beginning to be more efficacious in Canvas® LMS tools use for feedback purposes. The effect size among comparison group participants for self-efficacy (media) was large, and means remained very low at posttest signifying disagreement with their self-efficacy, an expected finding as they were not taught to use the multimedia-based tools.

Last, frequency (media) resulted in low means and no statistical significance for either group. Means were lower for the treatment group and increased slightly for the comparison group at posttest. Frequency may not have increased due to a lack of time to try out the tools or due to a lack of assignments to grade as the present study started at the beginning of the semester.

Dependent-samples *t* tests that tested for differences on each of the nine variables indicated that the treatment group changed in the direction of agreement on the monmultimedia items. The same tests yielded differences in the direction of disagreement from pretest to posttest for ease and ease (media), and for this test, ease was statistically significant in a negative direction with a large effect size. These findings illustrate that the variables of ease and ease (media) revealed some change in the direction of increased perceived ease of use among instructors.

The least amount of change resulting from the interventions among instructors in the present study are associated with the self-efficacy, self-efficacy (media), frequency, and frequency (media) variables.

Self-efficacy (media) does indicate that the treatment group has more self-efficacy than the comparison group in using multimedia-oriented technology for feedback purposes after being trained as evidenced by a much larger effect size. Even though the responses were closer to disagree than agree on the Likert scale, there was more movement to agree for the treatment group on audio-based feedback, video-based feedback, and the speech-to-text-recognition feature than with the comparison group. If instructors do decide to provide multimedia-based feedback to their students, it is more likely to be associated with formative than summative feedback as was suggested in a previous study that addressed instructor use of real-time clickers used with classroom communication systems (Han & Finkelstein, 2013).

Means for self-efficacy were low as reported at pretest by the treatment and comparison groups, and at posttest, the opinions of both groups moved in the direction of agree from disagree with statistically significant paired-samples *t* test results. The treatment group's effect size for self-efficacy was large (ES = 0.86) suggesting that instructors indicated that they were not very skilled to somewhat skilled at using the basic features of the Canvas® LMS posttreatment. For self-efficacy the effect size for the comparison is much stronger (ES = 1.25) than the effect size for the treatment group (ES = 0.86).

Frequency and frequency (media) are the most interesting variables to the researcher. Frequency results in statistically significant findings for the comparison group with a large effect, and means are a one half of a point greater at posttest. The lack of statistical significance and nearly no difference in means on behalf of the treatment group for both variables is a concern in light of the preferences and expectations of students that include increased use of technology in the teaching and learning process and reduced reliance on traditional teaching methods (Vincelette & Bostic, 2013). Structural equation modeling in a TAM research study suggests that usefulness has a statistically significant positive effect on intent and that ease has no effect on intent (Wang & Wang, 2009), so it may not be the ease of use but instead the value (or usefulness) that motivates instructors to use technology for feedback purposes.

Implications for Research

Designing, building, and implementing a learning management system at a university is an expensive task with costs ranging from $60,000 to millions of dollars (Black, Beck, Dawson, Jinks, & DiPietro, 2007). Students are using technology for learning in greater frequency (Smith, Salaway, & Caruso, 2009) as it becomes more ubiquitous and for at least 5 years research (since 2010) has suggested that video can help enhance the learning process for the student and increase acquisition of knowledge and skill (Chan & Lam, 2010; Forbes et al., 2016). Additional research on the motivating factors of instructor use and student expectations regarding multimedia-based feedback that use currently available technologies will help to clarify what instructors are comfortable using for feedback and how students expect and perceive that feedback.

A follow-up study that targets instructors who grew up with and are very used to technology (a young demographic) will help to better identify technology use in teaching among younger-age populations. Additional research using a similar theoretical framework, similar constructs, and a qualitative component on a much larger scale is needed to better understand if the results of the present study will generalize to other populations. The present study was conducted near Silicon Valley, California where technology often is designed, and there are many universities nearby to obtain participants for a larger study. Interested instructors may be identified to participate on the West Coast of the United States, for the present study 52 of 60 university instructors self-enrolled and completed both the pretest and posttest (representing a 86% response rate of completions for the postmeasures questionnaire).

The high participation rate and response rate on the postmeasues questionnaire illustrates that instructors are interested in adding to their base of knowledge regarding multimedia-based feedback. The findings from a study of larger scale will help instructors to cultivate their own strategies related to multimedia-based feedback (Hung, 2016). An educational research organization such as Wiley Learning or Association of College and University Educators has the potential to take this small study and replicate it on a larger scale, ideally with hundreds of instructors as participants. A larger approach may help to diversify the demographics that the present study did not have (65% of participants were over 50 years of age and 30% of participants had over 20 years teaching experience).

It is possible that instructors who did not grow up with technology are more likely to attend LMS training than those who did grow up with technology and are better able to teach themselves. The Center for Instruction and Technology at the university where the study was conducted would be a good candidate to conduct a broad study.

Continued research focused on the Canvas® LMS from the perspective of the student is needed as results that support the use of multimedia including audio and video for feedback purposes may help sway the opinions of instructors toward the direction of increased use. The results of the present study can be used to design a study that would allow for a comparison of results between instructors and students. Research focused on use of video for feedback purposes investigated if video-based feedback might enhance the learning experience for both students and instructors and suggested that use of video for feedback resolved common problems associated with traditional forms of feedback (Crook et al., 2012). Student achievement after receipt of multimedia-based feedback also could be researched in the future.

The theoretical framework used in the present study was the original Technology Acceptance Model (TAM), and TAM is now on the third iteration with expanded variables as inputs to usefulness and ease. Variables more relevant to current times including job relevance, computer anxiety, computer playfulness, perceived enjoyment, and objective usability (Chuttur, 2009) may help to design a future study that meets current research needs.

Last, further research that measures teaching discipline, instructor preferences for feedback, and actual usage would be a valuable addition to the body of research. A correlational study that investigates how training effects TAM variables including teaching discipline, feedback preferences, and actual usage can provide tangible information to the academic community and others who benefit from empirical research. Future research also may include a qualitative component to ensure that data are collected in the two primary research modalities (qualitative and quantitative).

A longer span of time between pretest and posttest data collection may provide instructors with opportunities to practice what they learned in the training. A study designed to collect pretest data and administer the treatment at the beginning of the semester and then collect posttest data at the end of the semester may provide more reliable data and interpretations of the data.

Implications for Practice

Although the results of the present study did not support (with statistical significance) frequency, frequency (media), self-efficacy, or self-efficacy (media) of Canvas® LMS usage, there are practical considerations to be realized. Including pilot participants, 90 instructors were trained on either basic Canvas® LMS functions (comparison group) or the relatively new Canvas® LMS features including the audio- or video-based and speech-to-text recognition feedback features (treatment-group participants). During the pilot test, a participant commented that the use of video to provide feedback in language classes could be very beneficial because the video allows for the learner to see the enunciation of the words when spoken from the mouth.

The present study may also help inform the Center for Instruction and Technology (CIT) to build their schedule of Canvas® LMS training offerings. The Canvas® Feedback and Assessment class that was written by the researcher for the purposes of the present study has been deemed valuable enough that the CIT has added it to the Summer schedule of Canvas® LMS training offerings.

The results of the present study did not find that intent to use multimedia for feedback purposes increased after being trained on the tools; however, data were collected 30 days after the training took place so it is difficult to recommend that instructors increase their use of those tools based on the short 30-day treatment time. The CIT can use the results of the present study to redesign their training curriculum into smaller lessons that instructors take at the time of need. It is possible that a 2-minute simulation (video) that provides instruction on the audio-feedback, video-feedback, or speech-to-text-recognition tools may increase instructor use of those tools.

Researchers and graduate students may find the results of the present study to be useful in their own research efforts. The TAM has been characterized as a widely used theoretical model for technology usage research (King & He, 2006) and is one of the strongest models available to help explain end-user technology adoption at the individual level (Wu, Zhao, Zhu, Tan, & Zheng, 2011). In the present study, companion variables that asked questions related to usage were created (multimedia) that may contribute to the design of future research studies.

Conclusions

The present study has resulted in several conclusions. First, although intent to use technology and frequency were not statistically significant, several participants reported that they were not self-efficacious on their questionnaire responses. It is possible that instructors of certain disciplines (such as language instructors) perceive value and potential benefit from their experience in participating in the study and that their use of the tools may start or increase. A meta-analysis of 91 studies that evaluated 715 effect sizes found an overall effect size of .64 when feedback was provided in audio or video formats (Hattie & Timperley, 2007). In fact, the only effect sizes that were higher than audio- or video-based feedback were reinforcement, feedback (itself), and cues (or hints) that require real-time human intervention. The effect sizes indicate that audio- or video-based feedback should be provided when an instructor is not available to work directly with the student.

The data suggested that regardless of what group (treatment or comparison) Canvas® LMS training does increase ease of use of multimedia-based tools for feedback purposes and does increase ease of use of nonmultimedia tools as well. Data associated with the self-efficacy measurement increased at posttest but was near the disagree selection that may have to do with the participants' personal confidences, the quality of the training intervention, the ease of use of the Canvas® LMS, or the short duration between data-collection times.

The Canvas® Feedback and Assessment class that was designed and developed for the study is still in use today and has been added to the Summer schedule of Canvas® training at the university. Research with instructors as participants can be challenging, and the present study suggested that if designed properly and if provided with a chance to learn something new that may help make work-life easier, instructors will participate in research if it helps the University and if it contributes to education and to making the world a better place.

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Appendixes

Appendix A

Questionnaire Validation Rubric for Expert Panel

Questionnaire Validation Rubric for Expert Panel - VREP©
By Marilyn K. Simon with input from Jacquelyn White

Criteria	Operational Definitions	Score 1=Not Acceptable (major modifications needed) 2=Below Expectations (some modifications needed) 3=Meets Expectations (no modifications needed but could be improved with minor changes) 4=Exceeds Expectations (no modifications needed)				Questions NOT meeting standard (List page and question number) and need to be revised. Please use the comments and suggestions section to recommend revisions.
		1	2	3	4	
Clarity	The questions are direct and specific. Only one question is asked at a time. The participants can understand what is being asked. There are no double-barreled questions (two questions in one).					
Wordiness	Questions are concise. There are no unnecessary words					
Negative Wording	Questions are asked using the affirmative (e.g., Instead of asking, “Which methods are not used?”, the researcher asks, “Which methods are used?”)					
Overlapping Responses	No response covers more than one choice. All possibilities are considered. There are no ambiguous questions.					
Balance	The questions are unbiased and do not lead the participants to a response. The questions are asked using a neutral tone.					
Use of Jargon	The terms used are understandable by the target					

	population. There are no clichés or hyperbole in the wording of the questions.					
Appropriateness of Responses Listed	The choices listed allow participants to respond appropriately. The responses apply to all situations or offer a way for those to respond with unique situations.					
Use of Technical Language	The use of technical language is minimal and appropriate. All acronyms are defined.					
Application to Praxis	The questions asked relate to the daily practices or expertise of the potential participants.					
Relationship to Problem	The questions are sufficient to resolve the problem in the study The questions are sufficient to answer the research questions. The questions are sufficient to obtain the purpose of the study.					
Measure of Construct: A: ( )	The questionnaire adequately measures this construct.*[Include Operational Definition and concepts associated with construct]					
Measure of Construct: B: ( )	The questionnaire adequately measures this construct. *[Include Operational Definition and concepts associated with construct]					
Measure of Construct: C: ( )	The questionnaire adequately measures this construct.* [Include Operational Definition and concepts associated with construct]					
Measure of Construct: D: ( )	The questionnaire adequately measures this construct.* [Include Operational Definition and concepts associated with construct]					

* The operational definition should include the domains and constructs that are being investigated. You need to assign meaning to a variable by specifying the activities and operations necessary to measure, categorize, or manipulate the variable For example, to measure the construct successful aging the following domains could be included: degree of physical disability (low number); prevalence of physical performance (high number), and degree of cognitive impairment (low number). If you were to measure creativity, this construct is generally recognized to consist of flexibility, originality, elaboration, and other concepts. Prior studies can be helpful in establishing the domains of a construct.

Comments and Suggestions

Types of Validity

VREP is designed to measure face validity, construct validity, and content validity. To establish criterion validity would require further research.

Face validity is concerned with how a measure or procedure appears. Does it seem like a reasonable way to gain the information the researchers are attempting to obtain? Does it seem well designed? Does it seem as though it will work reliably? Face validity is independent of established theories for support (Fink, 1995).

Construct validity seeks agreement between a theoretical concept and a specific measuring device or procedure. This requires operational definitions of all constructs being measured.

Content Validity is based on the extent to which a measurement reflects the specific intended domain of content (Carmines & Zeller, 1991, p.20). Experts in the field can determine if an instrument satisfies this requirement. Content validity requires the researcher to define the domains they are attempting to study. Construct and content validity should be demonstrated from a variety of perspectives.

Criterion related validity, also referred to as instrumental validity, is used to demonstrate the accuracy of a measure or procedure by comparing it with another measure or procedure which has been demonstrated to be valid. If after an extensive search of the literature, such an instrument is not found, then the instrument that meets the other measures of validity are used to provide criterion related validity for future instruments.

Operationalization is the process of defining a concept or construct that could have a variety of meanings to make the term measurable and distinguishable from similar concepts. Operationalizing enables the concept or construct to be expressed in terms of empirical observations. Operationalizing includes describing what is, and what is not, part of that concept or construct.

References

Carmines, E. G. & Zeller, R.A. (1991). Reliability and validity assessment. Newbury Park: Sage Publications.

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Appendix B

Written Invitation of Participation for Study Participants

PILOT STUDY OF THE RELATIONSHIP OF PERCEIVED USEFULNESS, PERCEIVED EASE OF USE, AND ATTITUDE TOWARD TECHNOLOGY USE AMONG INSTRUCTORS WHO COMPLETE BASIC OR ADVANCED LMS TRAINING

Christopher O'Leary, MA, MS is conducting a confidential and anonymous study of how instructors use technology-based technology tools to provide feedback to students within the areas of feedback in teaching and if training effects instructor intentions and preferences. The present study is toward completion of his doctoral studies in the School of Education. Your involvement will help inform researchers, professors, university leadership, university faculty, and learning management system (LMS) developers about instructor preferences and comfortability in technology use for feedback purposes.

The procedures for the questionnaire will take place in the School of Education and online. By agreeing to participate in the present questionnaire, you are asked to complete two 10-minute online questionnaires. If you do not wish to complete the questionnaire, please review the course materials while the others are completing the questionnaire.

You may stop the questionnaire or training at any time. Participation in this research will not result in a loss of your confidentiality, and every attempt will be made to keep your individual responses confidential. Your identity will not be used in any reports or publications resulting from the study.

There will be no cost to you for participating in the present study. You may find completion of the questionnaire and training class as a reflective experience that guides your professional development. Every participant who participates in the research study will receive a Target gift card and will also be entered in a random drawing to win a brand new iPad Mini (16gig WiFi-only).

For the purposes of sending you a reminder to **complete the postmeasures questionnaire 4 weeks from today** and to notify the winner of the iPad Mini the last question of the electronic questionnaire will allow you to enter your email address so that you may be reminded to complete the follow up questionnaire and to notify the winner of the iPad Mini.

Questionnaire Login: In order to make comparisons of the premeasures questionnaire and postmeasures questionnaire data you will be asked to create a secret code when you log into each of the two questionnaires. The code should be easy to remember and may be your primary email address. Your questionnaire responses will not be linked to the email address that you provide.

If you have questions or comments about the study, first contact the researcher, [RESEARCHER NAME] by emailing xxxxx@xxxxx.edu. If for some reason you do not wish to do so, you may contact the IRBPHS, which is concerned with the protection of volunteers in research studies.

Thank you, Christopher O'Leary, MA, MS
Doctoral Student

Appendix C

Training Materials for Treatment Group: Canvas® Feedback and Assessment (Advanced Course)

Canvas Feedback & Assessment: Rich Content Editor

Description:

In the *Canvas Feedback & Assessment Workshop* we will:

- Access the Rich Content Editor to:
    1. Create audio-based feedback
    2. Create video-based feedback

Resources:

USF Canvas One-Stop Page - https://www.usfca.edu/its/learning/canvas/home/
Canvas Guides from Instructure

- Full List of Guides - http://guides.instructure.com/m/8472
- Instructor Guides - http://guides.instructure.com/m/4152
- Video Guides: http://guides.instructure.com/m/4210

Key Components of a Learning Management System

Teachers

- Create an online class
- Add assignments
- Add resources
- Grade assignments
- Communicate with students

Students

- Access an online class
- Access syllabus and assignments
- Find and use course resources
- Turn in assignments/view grades
- Communicate with instructor and fellow students

Canvas Rich Content Editor

The Rich Content Editor Canvas is a simple, yet powerful, word processor that is available anytime for creating new content (assignments, announcement, discussions, blogs etc.) within Canvas.

Although clean and streamlined, the Rich Content Editor is sophisticated enough to support embedding any video content, math formula, and other rich media.

What Canvas Features Use the Rich Content Editor?

The following Canvas features use the Rich Content Editor:

- Announcements
- Assignments
- Discussions
- Pages
- Quizzes
- Syllabus

********Practice#1******************

In this exercise you will:

- Record an audio-based feedback message for your student
- Review the recording
- Save the recording
- Publish the recording for the student to view

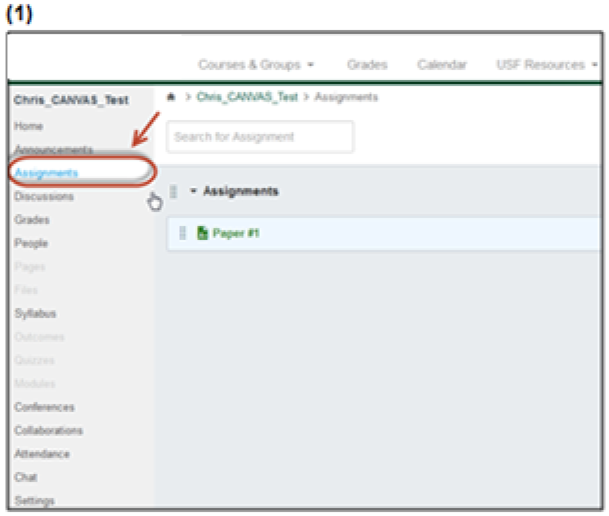
Create Audio-Based Feedback

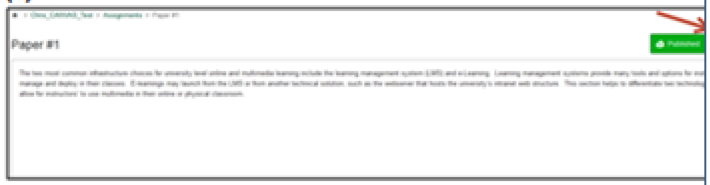
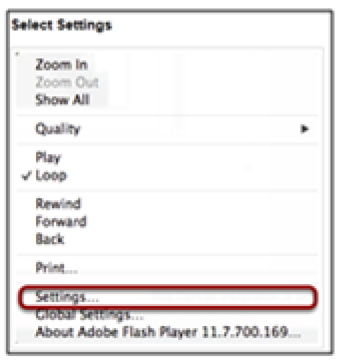
Open the Rich Content Editor

Open the Rich Content Editor using one of the Canvas features which support the Editor (in this example "Assignments" is used to illustrate the audio-based feedback function).

1. **Click** on Assignments

(1)



2. **Click Edit** to open the assignment.	(2) 
3. **Open** the Media Comment Tool	(3) 
4. **Click Allow** to give the Adobe Flash Player access to your computer's camera and microphone.	(4) 
5. **Select Settings:** You can open the Settings for the Flash Player to select specific options for your audio recording. To open the settings, **Right-click (PC users)** or **Control-click (MAC users)** anywhere on the media window.	(5) 
6. **Modify the settings:** You can select among the Flash Player Setting tabs and select your privacy settings [1] and local storage limit [2] on your local computer. You can also select a specific microphone [3] using the drop-down menu, if your computer contains more than one option.	(6) 

7. **Select the Audio Recording Option**:

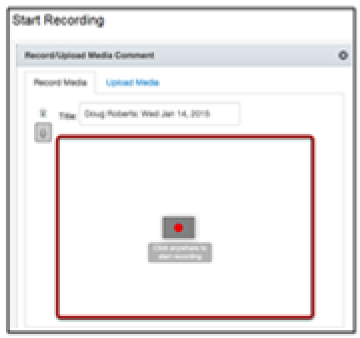
   Provide a title for the recording in the Title field.

   Click the Microphone icon to begin recording audio.

(7)

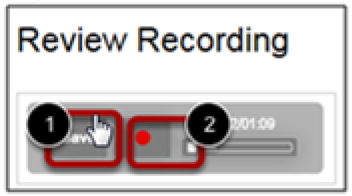
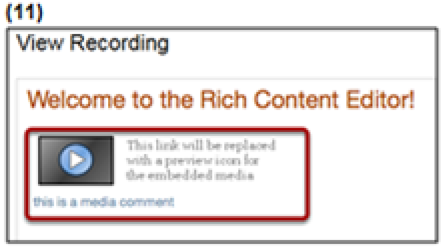
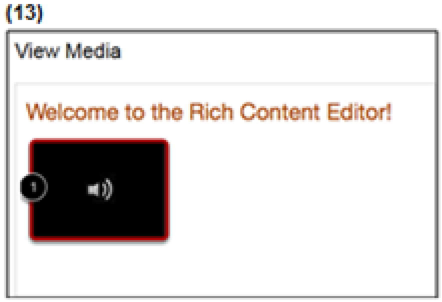
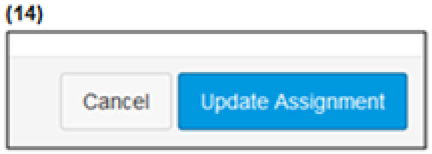
8. **Start Recording:** Click to start recording an audio file.

(8)



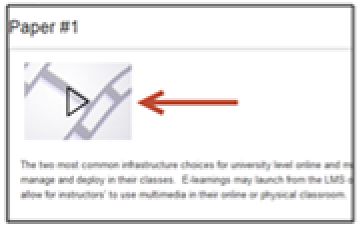
9. **Stop Recording:** The time [1] and the volume level [2] of your recording will continuously update as you record. Click anywhere to stop recording.

(9)

10. **Review your Recording:** Your recording will begin to playback automatically. Click Save to save your audio recording [1]. Click Record [2] to re-record your audio message.	(10) 
11. **View the Recording:** Your audio recording will be automatically inserted into the Rich Content Editor.	(11) 
12. **Save your changes:** Click **Save**.	(12) 
13. **View the media:** You can listen to the audio file by clicking on the preview [1].	(13) 
14. **Save** the recording to the assignment by clicking Update Assignment.	(14) 

15. **You will now see** the published audio feedback embedded into the assignment. (Your student will see the same in their Canvas account and may listen to the feedback by clicking on the icon).

(15)



16. **Be sure to publish** the feedback. Unpublished, pictures depict both published and unpublished).

(16)

Result

You have now annotated a student's submission with an audio-recorded feedback message! When the student opens their assignment in Canvas the audio feedback message will be clearly displayed for viewing.

****

********Practice#2******************

In this exercise you will:

- Record an video-based feedback message for your student
- Review the video file
- Save the video file
- Publish the video file for the student to view

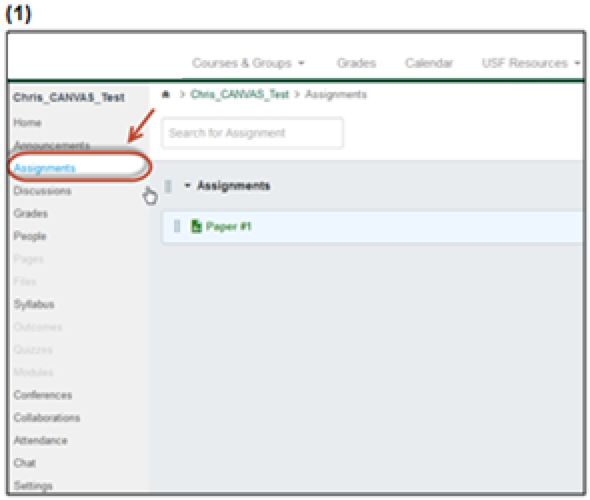
<u>Create Video-Based Feedback</u>

Open the Rich Content Editor

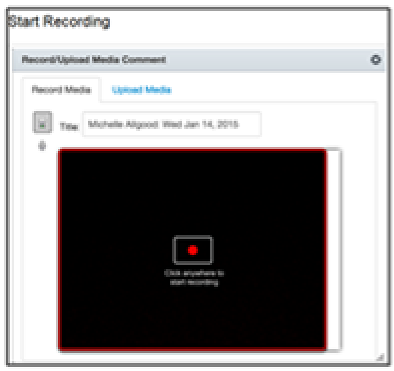
Open the Rich Content Editor using one of the Canvas features which support the Editor (in this example "Assignments" is used to illustrate the video-based feedback function).

1. **Click** on Assignments

(1)



2. **Click Edit** to open the assignment.	**(2)** 
3. **Open** the Media Comment Tool.	**(3)** 
4. **Click Allow** to give the Adobe Flash Player access to your computer's camera and microphone.	**(4)** 
5. **Select Settings:** You can open the Settings for the Flash Player to select specific options for your audio recording. To open the settings, **Right-click (PC users)** or **Control-click (MAC users)** anywhere on the media window.	**(5)** 
6. **Modify the settings:** You can select among the Flash Player Setting tabs and select your privacy settings [1] and local storage limit [2] on your local computer. You can also select a specific microphone [3] using the drop-down menu, if your computer contains more than one option.	**(6)** 

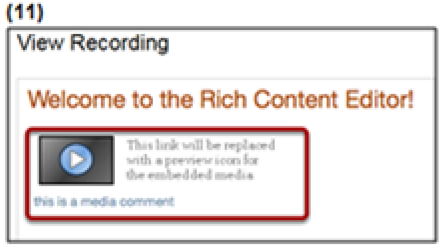
7. **Select the Video Recording Option**: Provide a title for the recording in the Title field. Click the Webcam icon to begin recording video.	**(7)** 
8. **Start Recording:** Click to start recording a video file.	**(8)** 
9. **Stop Recording:** The time [1] and the volume level [2] of your recording will continuously update as you record. Click anywhere to stop recording.	**(9)** 

10. **Review your Recording:** Your recording will begin to playback automatically. Click Save to save your video recording [1]. Click Record [2] to re-record your video recording.

(10)

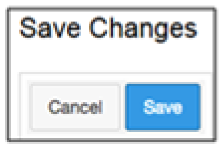
11. **View the Recording:** Your video recording will be automatically inserted into the Rich Content Editor.

(11)



12. **Save your changes:** Click **Save**.

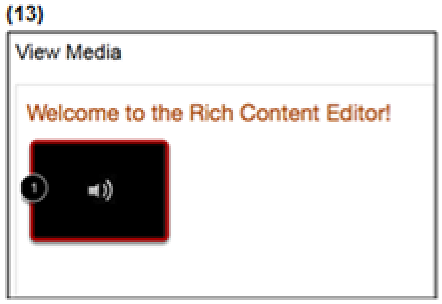
(12)



]

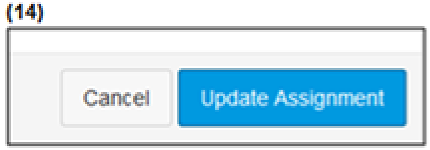
13. **View the media:** You can listen to the video file by clicking on the preview [1].

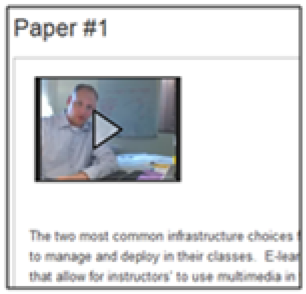
(13)



14. **Save** the recording to the assignment by clicking Update Assignment.

(14)



15. **You will now see** the published video feedback embedded into the assignment. (Your student will see the same in their Canvas account and may listen to the feedback by clicking on the icon).	**(15)** 
16. **Be sure to publish** the feedback. Unpublished, pictures depict both published and unpublished).	**(16)** 
****************Result****************** You have now annotated a student's submission with a video-recorded feedback message! When the student opens their assignment in Canvas the video feedback message will be clearly displayed for viewing.	

Reference

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Canvas Guides. Retrieved March 1, 2015, from http://guides.instructure.com/

Appendix D

Example of Training Materials for Comparison Group: Canvas® Essentials (Basics Course)

Canvas Essentials

Description:

In the *Canvas Essentials Workshop* we will:

1. Configure a few basic course Settings
2. Upload Files to our Course Files Repository
3. Link a Syllabus to a Page
4. Configure our Course Homepage
5. Create an Assignment
6. Grade our Assignment
7. Organize our Course with Modules

We will also explore ways to communicate and interact with students via:

- Announcements
- Discussions
- The Canvas Conversation Inbox

Resources:

Canvas One-Stop Page - https://www.usfca.edu/its/learning/canvas/home/

Canvas Guides from Instructure

- Full List of Guides - http://guides.instructure.com/m/8472
- Instructor Guides- http://guides.instructure.com/m/4152
- Video Guides: http://guides.instructure.com/m/4210

Key Components of a Learning Management System

Teachers

- Create an online class
- Add assignments
- Add resources
- Grade assignments
- Communicate with students

Students

- Access an online class
- Access syllabus and assignments
- Find and use course resources
- Turn in assignments/view grades
- Communicate with instructor and fellow students

1. Select Your Course from the Global Navigation Bar

- Courses are unpublished and invisible to students. You may publish the course by clicking on the "published" link on the course home page

2. View Navigation Menu

- The Sidebar menu contains Links to the full array of Canvas options and tools. We will refer to this area as we configure our course and add content

- Important "content repository" Links. Content is kept here but can be linked from here.
  - Assignments
  - Discussions
  - Pages
  - Files
  - Quizzes
  - Syllabus

- Important "tool" and "configuration" links
  - Settings
  - Attendance
  - Gradebook
  - People

3: Select Course Settings Navigation Link

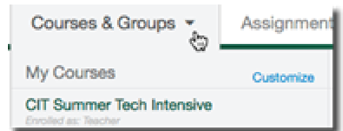
Course Setting Tabs

- ***Course Details***
  Configure basic settings in your course
- ***Navigation***
  Change order and hide navigation links

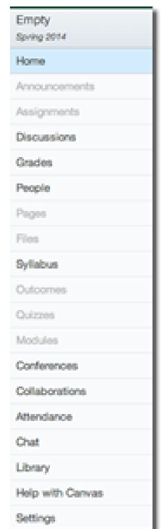
Side Menu

- **Student View** – Toggle to see what student sees
- **Import** – Import Content into Canvas from Blackboard or other Canvas course
- **Export**- Create a backup of your Canvas course

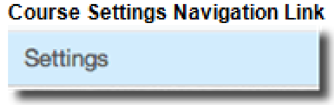
Your Course List



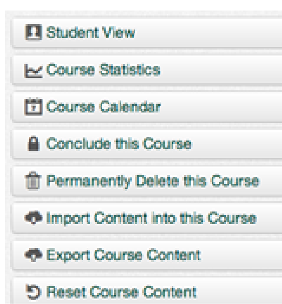
Course Navigation Menu



Course Settings Navigation Link



Common Tools in Course Settings Menu



**********Practice #1**********************************

In this exercise you will

- Hide the **Files** navigation link from students. Your files area is a repository of various files. You may use some in your course or not.
- Hiding this menu items prevents students from navigating in this repository and getting confused.
- You can always link to any files contained in this area later.

Course Settings

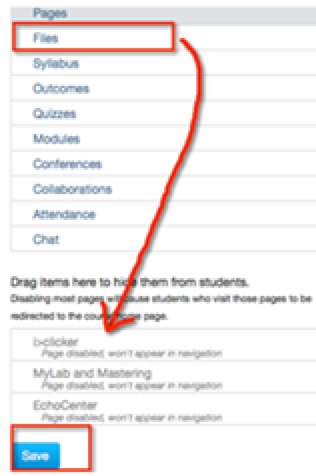
1. Click on **Settings** in the Navigation menu.
2. Select the **Navigation** tab.
3. Select the Files from the list a drag it to the lower section to "hide it from students"
4. Select Save to save your changes

****

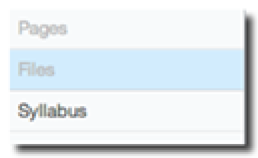
4: Add Basic Content

- You can **upload** PowerPoint, Word docs, HTML pages, PDFs, and many other file types to your Canvas Course.
- These are stored in your **Files Repository** accessible through the **Files** Navigation link
- You can upload a **single file** by selecting the **Add Files** link
- You can also **"drag and drop"** files from your computer file browser into the Files area.
- Additionally, you can upload multiple files and folders using the **"import a zip file"** button.
- You can preview the document by clicking on it in the left preview window

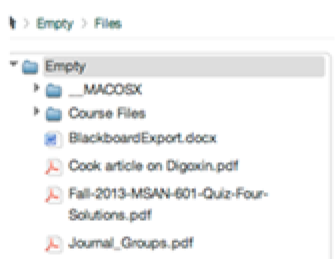
Hide Files Repository



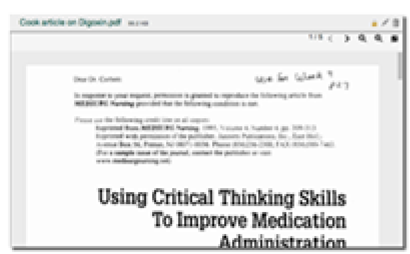
Files Repository Menu Link



Files preview pane



File in preview window



**********Practice #1**************************************

In this exercise you will

- Hide the **Files** navigation link from students. Your files area is a repository of various files. You may use some in your course or not.
- Hiding this menu items prevents students from navigating in this repository and getting confused.
- You can always link to any files contained in this area later.

Course Settings

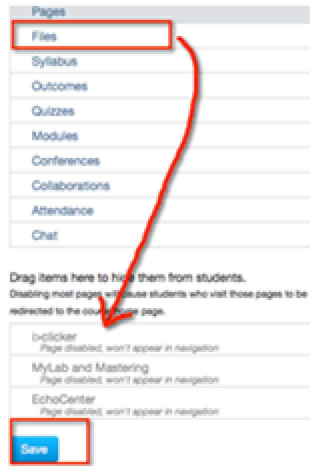
1. Click on **Settings** in the Navigation menu.
2. Select the **Navigation** tab.
3. Select the Files from the list a drag it to the lower section to "hide it from students"
4. Select Save to save your changes

****

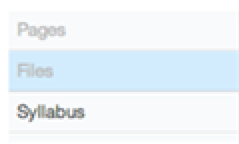
4: Add Basic Content

- You can **upload** PowerPoint, Word docs, HTML pages, PDFs, and many other file types to your Canvas Course.
- These are stored in your **Files Repository** accessible through the **Files** Navigation link
- You can upload a **single file** by selecting the **Add Files** link
- You can also **"drag and drop"** files from your computer file browser into the Files area.
- Additionally, you can upload multiple files and folders using the **"import a zip file"** button.
- You can preview the document by clicking on it in the left preview window

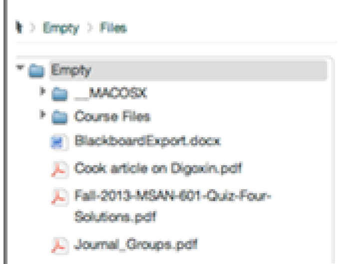
Hide Files Repository



Files Repository Menu Link



Files preview pane



File in preview window

****Practice #3**

For this exercise you will need digital files downloaded to your computer We will use these files as we build out our course. You will:

- Upload your Course syllabus
- Upload a Zipped File containing some of your course assets

If you need files from Blackboard, please see the **Migration tips for Faculty** document.
If you need sample files, please see the instructor

Upload Syllabus

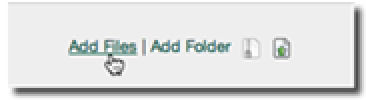
1. Select Files → Add Files
2. Navigate to your Syllabus file and select it.
3. The Syllabus will be uploaded to your files area.

Upload a Zipped File
Once upload to your course, Canvas will automatically unzip your file with your preserved file structure

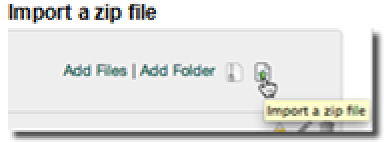
1. Zip your files.
   On a Mac, Shift-Select all your files and or folders
2. Next select file →Compress
3. In Canvas, select the Import zip file icon
4. Navigate to your computer and select your zip file
5. Once Selected, click **Upload File**

****

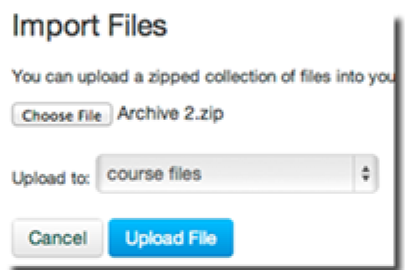
Add Files



Import a zip file



Selected zip file



5. Edit a Syllabus Page

- The Canvas **Syllabus** navigation link is a specialized Canvas content page.
- The top section of the page is editable. You can place a link to your Syllabus here or cut and paste the contents of your syllabus
- The bottom section will be dynamically updated as Assignments and events are added to your course

*************Practice #4**********************************

For this exercise you will:

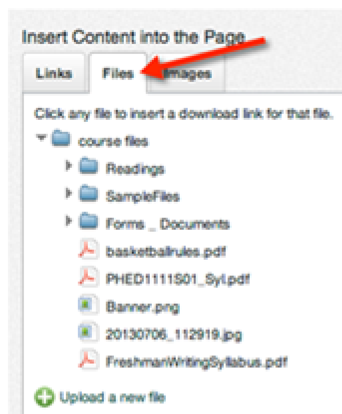
- Link your syllabus to **Canvas Syllabus Page** and preview it using the Scribd Reader.

1. Select **Syllabus** from the Navigation Menu
2. Select the **Edit Syllabus Description** button
3. You will be taken into the rich text editing tool. Write a brief introductory sentence to your syllabus.
4. Place your cursor where you want the syllabus to appear.
5. In the Page tools selection menu on the right, click on the **Files** tab. Navigate to your syllabus document add click on it. A link to it will be placed in your Syllabus page.
6. Click on the Magnifying glass icon to preview the document within your browser.
7. Save your changes

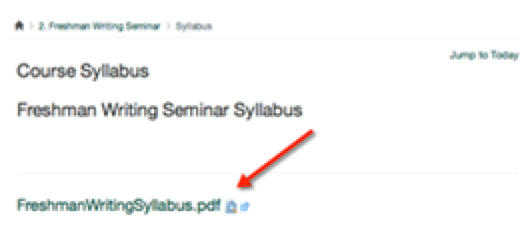
****

Sample Syllabus Page

Page Tools Selection Menu



Linked Syllabus



6. Create a Course Front Page

Right now when students come into your course they see a list of recent activity from the **Recent Activity Dashboard**. You can make this landing a little more inviting by configuring a **Custom** front page. You can easily link to assignments, files, etc. using the **"Page Tools"** section you'll see on the right once you start editing.

Five Possible Layouts for the homepage/dashboard:

1. Recent Activity Dashboard
2. Pages Front Page
3. Course Modules
4. Assignment List
5. Syllabus Page

************ **Practice #5** ******************************

For this exercise you will:

- Create a Simple Custom home page
- Embed media and link your syllabus page to this page.
- Set this page as your home page.

Create Home Page

1. Select **Pages** from the navigation menu
2. Click the **+Page** button
3. Enter a Title for your page. You can now start editing your home page and embed content.

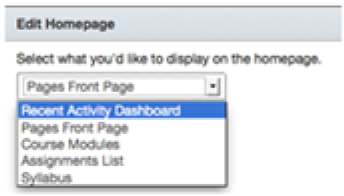
Embed media and link your syllabus page to this page

1. In the rich text editor. Use the tools to write a brief introductory paragraph of yourself and the course.
2. Click the image icon to embed a picture of yourself
3. Click the Youtube icon to search for and embed a Youtube video
4. Click the Media icon to record and embed this recording in your page.
5. We will next create a Link to your syllabus. Place your cursor where you want the link to appear. Type in the text, **Please Click here to view the course syllabus**
6. Highlight this text and select **Course Syllabus** from the Page Tools menu box to link to this text
7. Save your page changes by selecting the **Save Changes** Button
8. Select the **Publish** button at top right

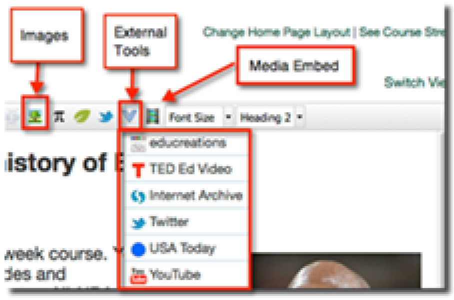
Set Home Page

1. Select the **View all Pages** button in the top left.
2. Use the edit button to **"Use as Front Page"**
3. Select the **Home** button to see you new front page.

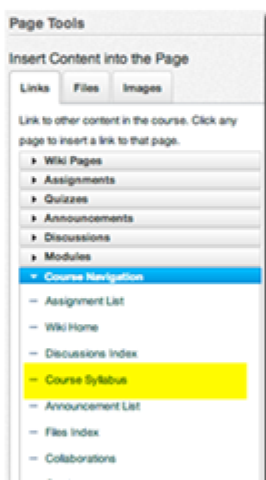
Home Page Options

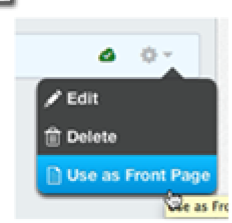


Media Embed Options



Page Tools Menu Box with Course Syllabus selected





7. Create Assignments

Assignments are items that automatically generate a column in the Gradebook. They include:

- Graded **Discussion** Assignments, General **Assignments** (graded and not graded) and Quizzes.

Major Grading Types

- **Points** –Recommended setting
- **Complete/Incomplete** -You would use this option, for example, if you wanted an assignment to be worth 0 points but wanted to keep track if it was completed or not. When grading, you would mark assignments as "complete" or "incomplete." In the Gradebook, a "complete" would be noted by a green checkmark and an "incomplete" would be noted by a red "X" mark.

The 2 Major Assignment Submission Types

No submission: students cannot submit anything online, but you will have a column in the grade book to use for tracking purposes and manual input
Online submission: allows any combination of file uploads, text entry, website URL, and/or media recordings.

Assessing the Assignment

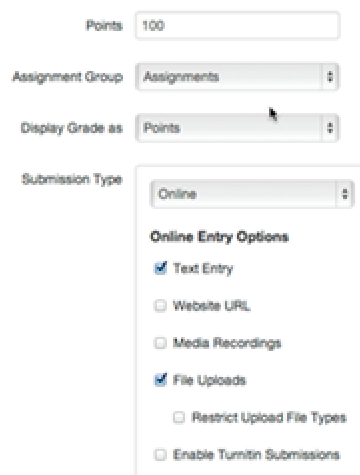
- Instructors can assess student assignments through the **Grades** page.
- In the Gradebook, general scores can be given and comments can be made.
- Two Major tools of the Gradebook include: SpeedGrader-Quickly cycle between student submissions
- **Mute/Unmute**-Hide students scores and release when in bulk when you are ready.

*****************Practice #6********************************

Creating the Assignment

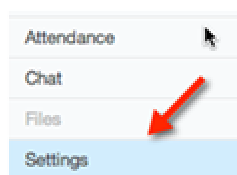
1. Create an Assignment with the following parameters
   a. Grading Type: Points (100)
   b. Online →Allow File Upload→Turnitin Enabled
   c. Due on tomorrow
   d. Select **Update Assignment**
2. To Make the Assignment visible to your students, select the **Publish** button in the upper right corner.
3. After you create the assignment, Enable **Student View** from the **course settings menu**
4. Navigate to the Assignment and **Submit** the Assignment as a Student.

Typical Assignment Parameters

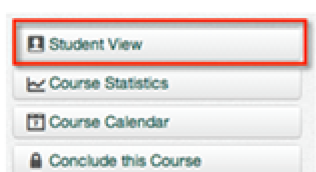


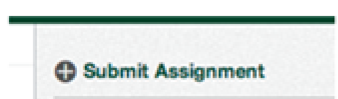
Publish Button

Course Settings



Student View button on Course Settings Screen





*************Practice #7******************************

Assessing the Assignment

Go back as an instructor and Grade the Paper with the SpeedGrader

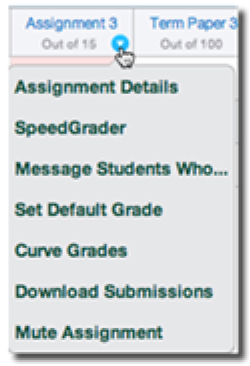
1. Click the Leave Student View button

2. Click on Gradebook and Click on the Assignment Column

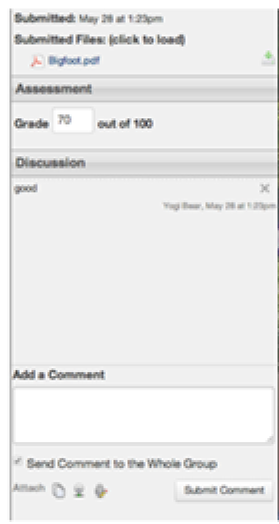
3. Select SpeedGrader. **Give a grade**. Make a **general comment**. Make a specific comment in the Crocadoc preview window

****

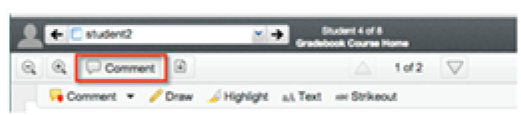
Gradebook Menu items



Speedgrader: Grade and General Comment tools



Speedgrader: Crocadoc Annotation tools.



8. Create Modules

Modules allow you to create the structure of the course. You can use modules to organize your course by weeks, units, or chapters, etc....

You can link to course content. The following types of content can be linked to:

- Assignments
- Quizzes
- Files you have uploaded or want to upload
- (Content) Pages,
- Discussion Topics
- URLs
- External tools such as Quizlet and Khahn Academy

With modules, you are essentially creating a one-directional linear flow of what you would like your students to do.

*******Practice #8************************************

Create a Module

1. First, click on Modules link in the course menu, and then click Create Module button on right.

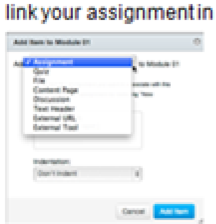
2. Name your module and choose your settings:
   a. Lock module - this allows a module to remain 'hidden' until desired date.
   b. Prerequisites– setting release criteria based on assignments that must be completed before the module is available.
   c. Sequential Order- force sequential order of module completion

Populate your Module with our course assets and organize its structure

1. Select the + icon and click **To Add Content**

2. Notice the grey cloud icon. If you want your module to show, you must publish it! By clicking this button.

3. Select **Assignment** from the dropdown list and select your previously created assignment. Select **Add Item** to link your assignment in your modules



4. Repeat this process, this time select **File** and add at least one file you have uploaded to your course.

5. Next select **External URL**. Enter in a URL of a website (google.com, yahoo.com etc) and give the link a name.

6. Select **Content Page**. Instead of selecting a existing page, select New Page. Call this page "instructions"

7. Let's create another page. We will call it Resources. It will contain list of resource files for our course.

8. Use the up and down arrows to organize your content

9. Select Add Content and this time choose "Text Header". Create Text Headers to further organize your module.

10. Finally click on the content pages you have created. Edit these pages. The **Instructions** page will contain instructions for that Module. The Resources page can be a comprehensive list of assets, linked to or embedded in the page.

****

9. Create an Announcement

- Announcements are One –Way
- Students are sent email notifications ASAP by default

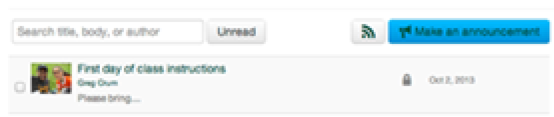
10. Create a Discussion

- Discussions are where student can reply to topics and interact with each other.
- Drag topics to Pinned area to order as wanted

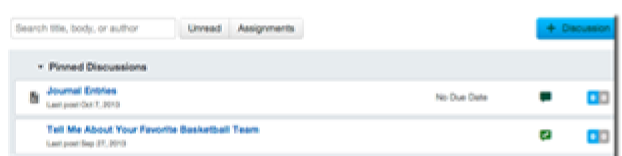
11. Send an Email

- Emails are stored and managed through the Conversation Inbox
- When email are sent, recipients are sent a notification to their USF inbox.
- The Notifications will have a link to the original email

Announcements

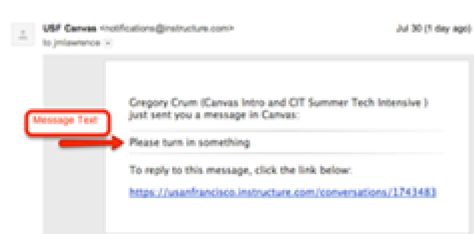


Discussions



Link to Email Inbox

Typical Notification



Canvas Feedback & Assessment: Discussion Boards

Description:

In the *Canvas Feedback & Assessment Workshop* we will:

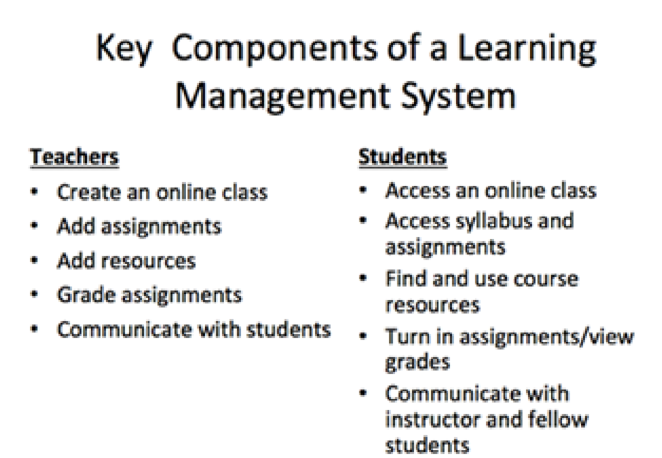
- Use the Canvas Discussion Board to:
    1. Start a discussion
    2. Edit a discussion topic:
        a. Provide audio, video, and text-recognized feedback
    3. Set up a graded discussion
    4. Allow students to start a new discussion
    5. Create peer review discussions

Resources:

Canvas One-Stop Page -https://www.usfca.edu/its/learning/canvas/home/

Canvas Guides from Instructure

- Full List of Guides -http://guides.instructure.com/m/8472
- Instructor Guides-http://guides.instructure.com/m/4152
- Video Guides: http://guides.instructure.com/m/4210



What are Discussions?

Canvas provides an integrated system for class discussions, allowing both instructors and students to start and contribute to as many discussion topics as desired. Discussions can also be created as an assignment for grading purposes (and seamlessly integrated with the Canvas Gradebook), or simply serve as a forum for topical and current events. Discussions can also be created within student groups.

- Help students start thinking about an upcoming Assignment or class discussion.
- Follow-up on a conversation or questions that began in a face-to-face classroom.
- Test student comprehension of important points made in class.
- Debate contradictory ideas.
- Brainstorm different approaches to a class problem.

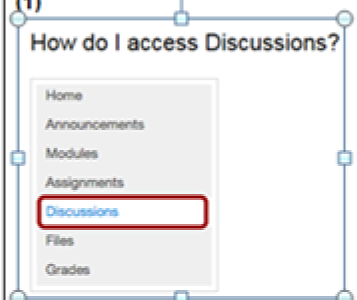
Note: Discussions are not the same as Announcements.

**********Practice#1*****************

In this exercise you will access and start a discussion.

1. **Click** on Discussions which is accessed in the Discussions link within Course Navigation.

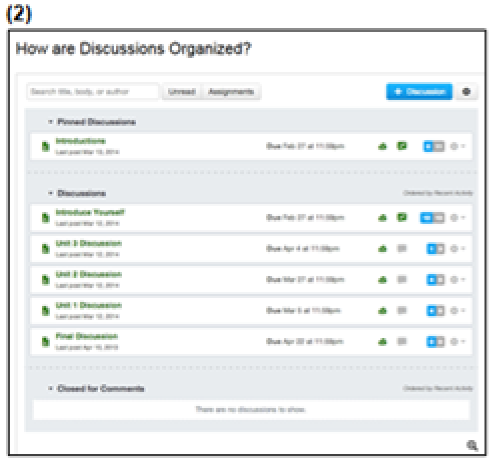
(1)



2. The Discussions Index Page is organized into three main areas:

- Discussions
- Pinned Discussions
- Closed for Comments Discussions.

(2)



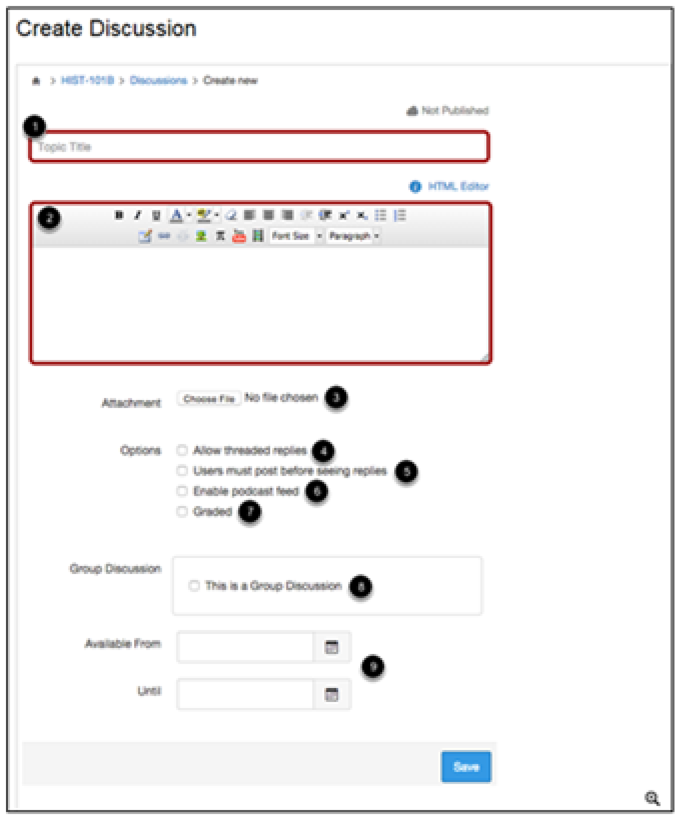
3. Start the discussion.

(3)

4. **Create Discussion – 9 Steps to Success:**

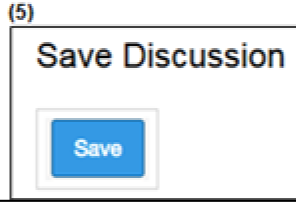
   Create your discussion by utilizing the following options:
   - Enter your topic title in the topic title field **[1]**.
   - Use the Rich Content Editor to format your content **[2]**.
   - Attach a file to your discussion **[3]**.
   - Create a threaded replies by clicking the Allow threaded replies checkbox **[4]**.
   - Require users to post to the discussion before viewing other replies by clicking the Users must post before seeing replies button **[5]**.
   - Create a podcast feed for the discussion by clicking the Enable podcast feed checkbox **[6]**.
   - Create a graded discussion by clicking the Graded checkbox **[7]**.
   - Create a Group Discussion by clicking the This is a Group Discussion checkbox **[8]**.
   - Make your discussion available on a certain date by filling out the Available From and Until fields **[9]**.

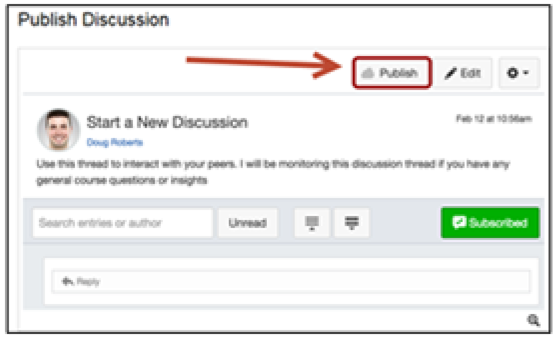
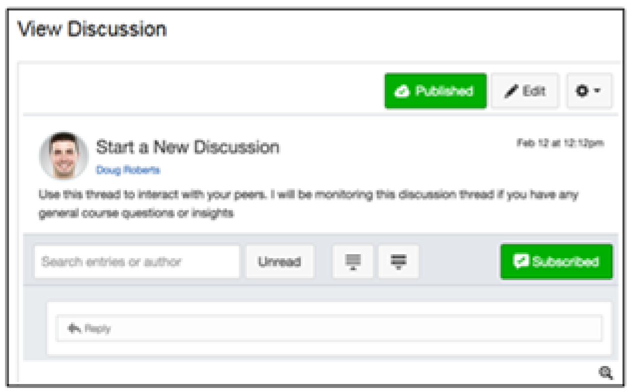
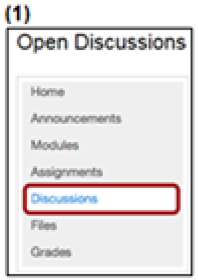
(4)



5. **Click the Save button** to start the discussion.

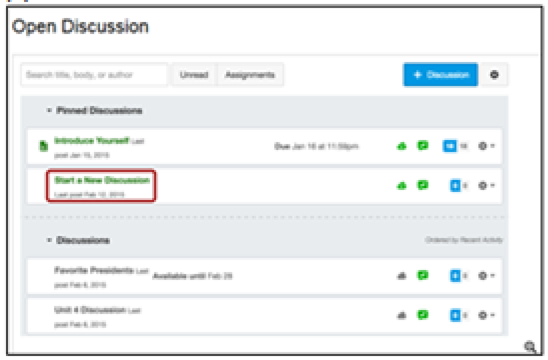
(5)



6. **Click the Publish** button.	**(6)** 
7. **View** the discussion.	**(7)** 
*************Result***************** You have now accessed and started a discussion.	
********Practice#2***************** In this exercise you will edit a discussion topic. 1. **Click** on Discussions which is accessed in the Discussions link within Course Navigation.	**(1)** 

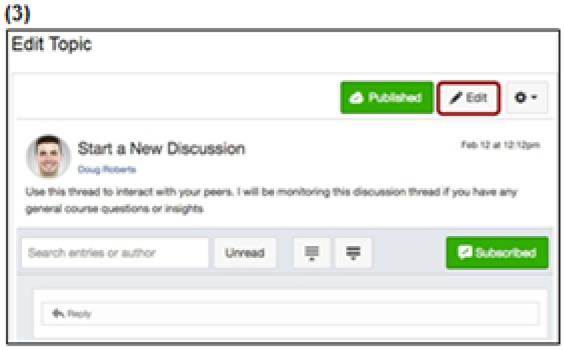
2. Click the title of the discussion.

(2)



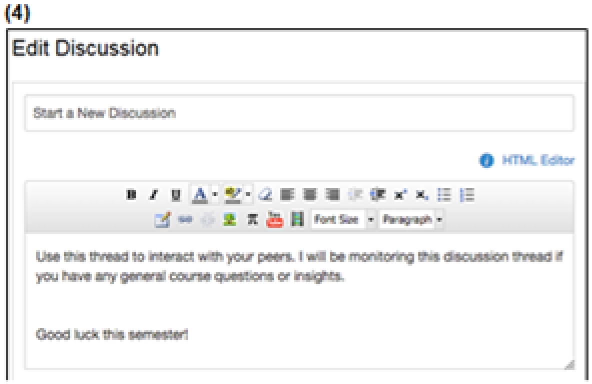
3. **Click** the Edit button.

(3)



4. **Edit the text** in the Rich Content Editor. You can also edit other options within the discussion.

(4)



<table>
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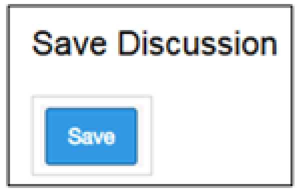
5. **Click the Save button** to save the discussion.

*************Result*****************

You have now edited a discussion topic.

</td>
<td>

(5)



</td>
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<td>

********Practice#3*****************

In this exercise you will set up a graded discussion.

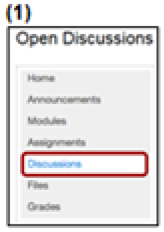
1. In Course Navigation, **click the Discussions** link.

2. **Click the Add Discussion** button.

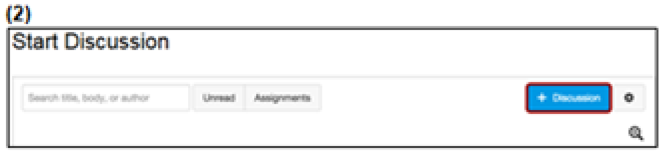
3. Create your discussion by utilizing the following options:
   - Enter your topic title in the topic title field.
   - Use the Rich Content Editor to format your content.
   - Create a graded discussion by clicking the Graded checkbox.

</td>
<td>

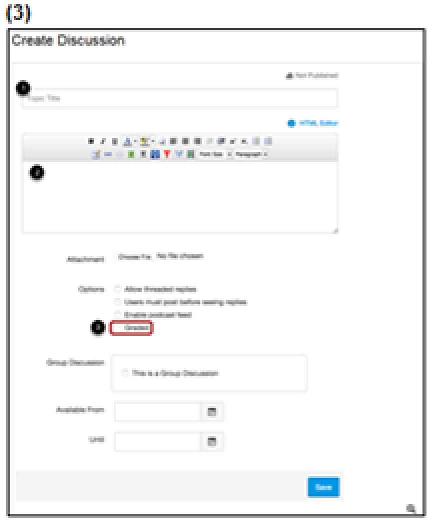
(1)



(2)



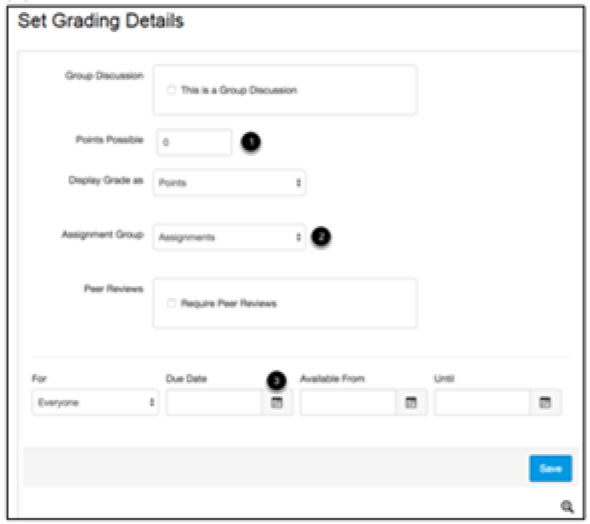
(3)



</td>
</tr>
</table>

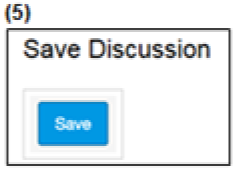
4. Type the number of points possible for the discussion in the points possible field **[1]**. Select the Assignment Group drop-down menu to assign the discussion to an assignment group **[2]**. Set the due date by clicking the Calendar icon **[3]**.

(4)



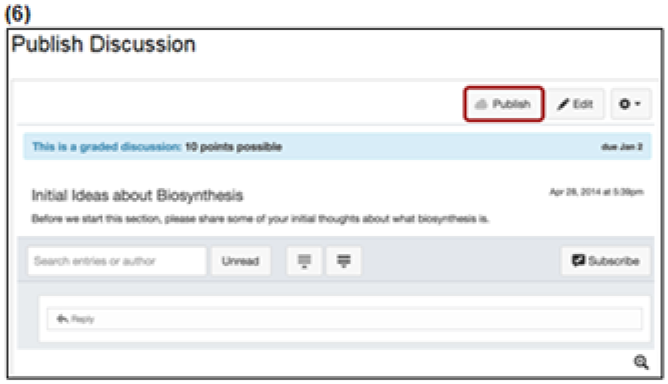
5. **Click the Save** button.

(5)



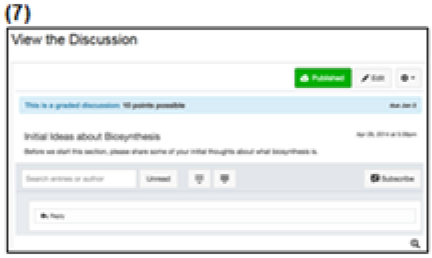
6. **Click the Publish** button.

(6)



7. **View** the graded discussion.

(7)

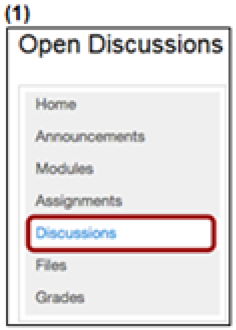


*************Result*****************
You have now set up a graded discussion.

********Practice#4*****************
In this exercise you will allow students to start a new discussion.

1. In Course Navigation, **click the Discussions** link.

(1)

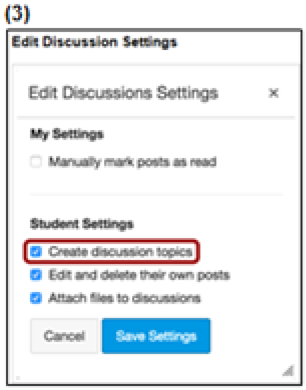


2. **Click the Settings icon** to open Discussion settings.

(2)

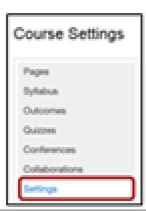
3. **Make sure you mark** the Create discussion topics checkbox.

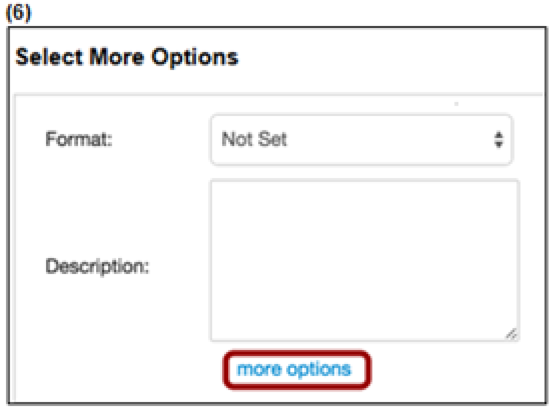
(3)



4. **You can also change** the Discussions permissions in the Course Settings.

(4)



5. **View the course details** and edit as necessary.	(5) 
6. **Click** the More Options link.	(6) 
7. **Check** the Let students create discussion topics checkbox.	(7)

<table>
<tr>
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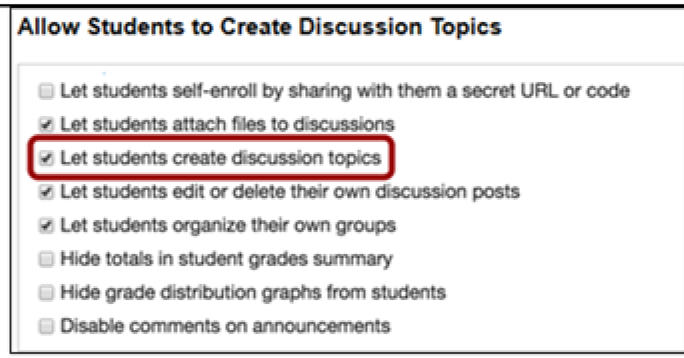
<td>
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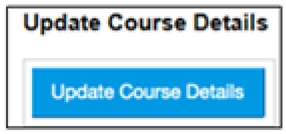
<tr>
<td>8. Click the Update Course Details button.</td>
<td>(8)

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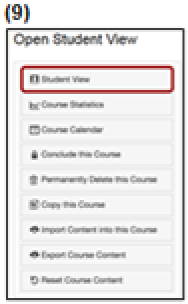
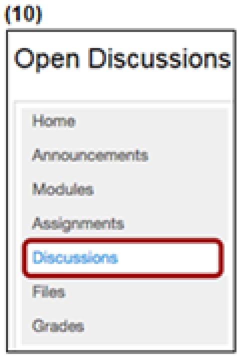
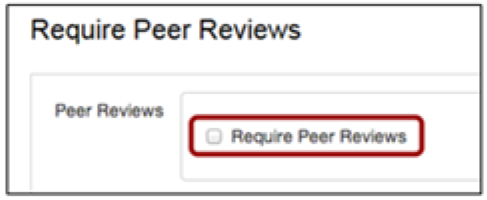
<tr>
<td>9. Click the Student View button.</td>
<td>(9)

</td>
</tr>
<tr>
<td>10. In Course Navigation, click the Discussions link.</td>
<td>(10)

</td>
</tr>
<tr>
<td>11. Verify that students can start a new discussion.</td>
<td>(11)</td>
</tr>
</table>

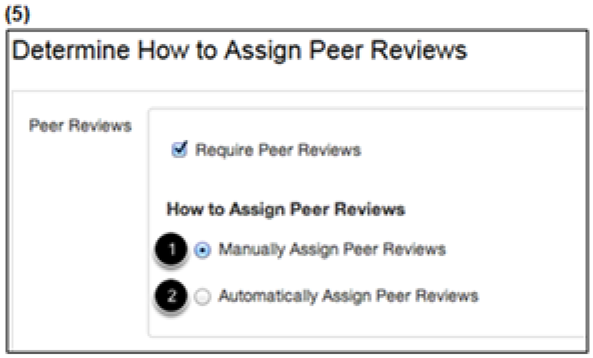
4. **Select** the Require Peer Reviews checkbox.

(4)



5. **Determine** if you are going to manually assign peer reviews **[1]** or automatically assign peer reviews **[2]**. Select the radio button next to the option you prefer.

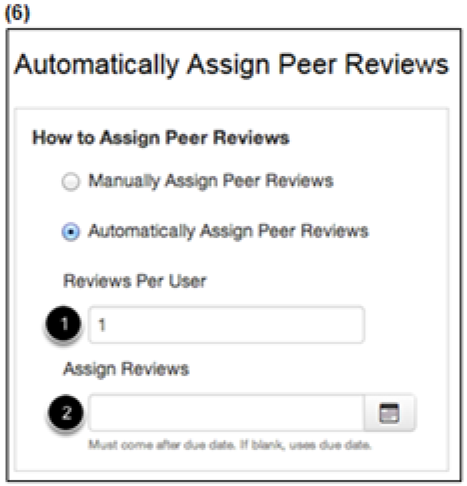
(5)



6. If you automatically assign peer reviews, the menu will expand. In the Reviews Per User field **[1]**, enter the number of reviews each student will be required to complete. In the Assign Reviews field **[2]**, use the calendar icon or manually enter in the date students should submit their peer review by.

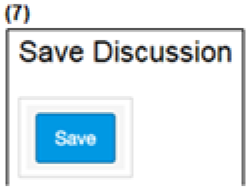
   Note: If automatically assigning peer reviews, the assign reviews date must come after the discussion due date. If left blank, Canvas will use the discussion due date as the peer review due date.

(6)



7. **Click** the Save button.

(7)

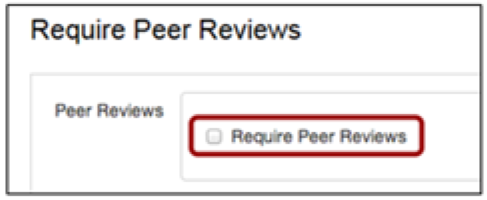


8. **Click** the Publish button to make

(8)

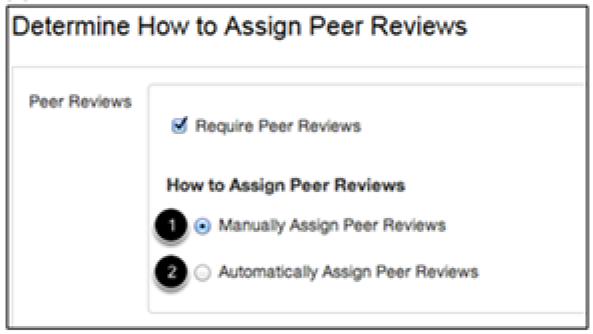
4. **Select** the Require Peer Reviews checkbox.

(4)



5. **Determine** if you are going to manually assign peer reviews **[1]** or automatically assign peer reviews **[2]**. Select the radio button next to the option you prefer.

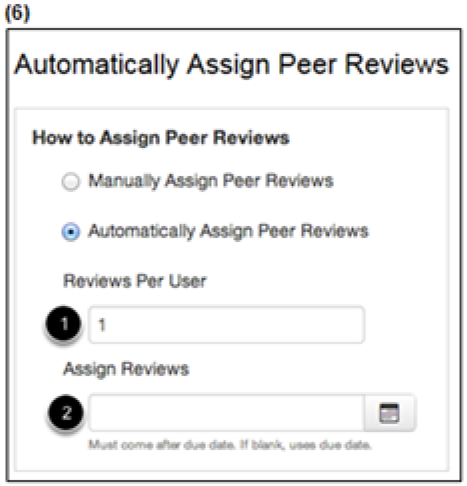
(5)



6. If you automatically assign peer reviews, the menu will expand. In the Reviews Per User field **[1]**, enter the number of reviews each student will be required to complete. In the Assign Reviews field **[2]**, use the calendar icon or manually enter in the date students should submit their peer review by.

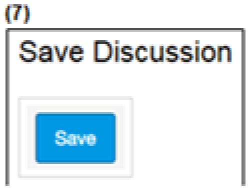
   Note: If automatically assigning peer reviews, the assign reviews date must come after the discussion due date. If left blank, Canvas will use the discussion due date as the peer review due date.

(6)



7. **Click** the Save button.

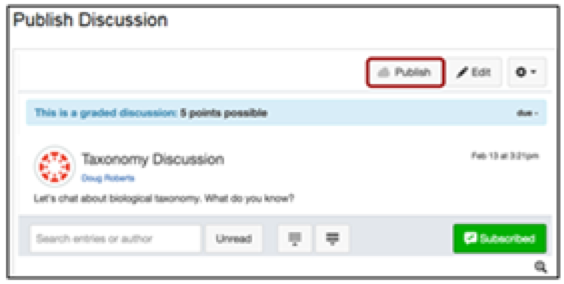
(7)



8. **Click** the Publish button to make

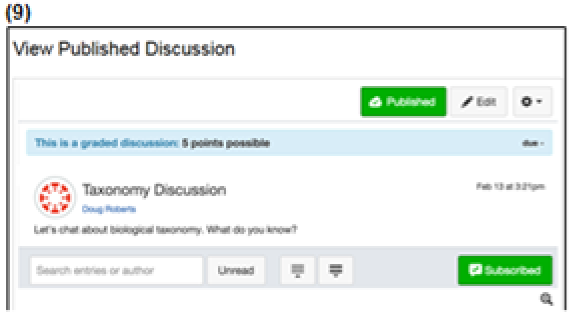
(8)

it visible to students.



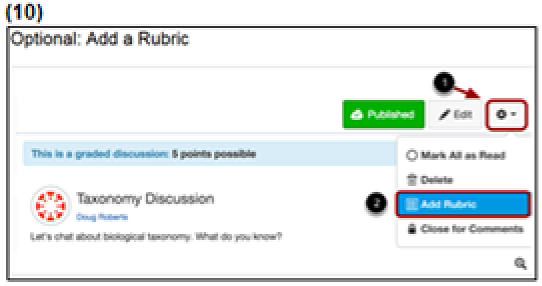
9. **View** the published discussion.

(9)



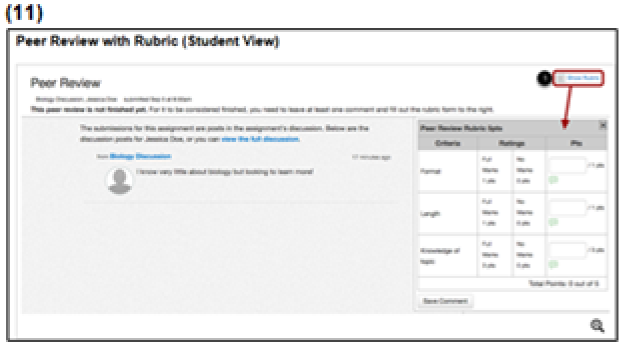
10. **OPTIONALLY:** You can also attach a rubric to the discussion for students to fill out when completing peer reviews. Click the settings icon **[1]** then click the Add Rubric link **[2]** to add a rubric to the graded discussion.

(10)



11. **For a peer review to be considered finished**, students will need to fill out the rubric attached to the discussion. To view the rubric, click the Show Rubric link **[1]**.

(11)



*************Result*****************

You have now created a peer review discussion.

Reference

Canvas Guides. Retrieved March 1, 2015, from http://guides.instructure.com/

Appendix E

Questionnaire Items & Construct Mapping

LMS Pilot Study Pre-and-post measures

CODE for Post questionnaire in 4 Weeks: Please create a unique code that you will use to log into the follow-up questionnaire in 4 weeks. The code is case sensitive and should be easy for you to remember. It is suggested that you use your email address as your secret code. A reminder to complete the follow-up questionnaire will be sent to you in 4 weeks.

Canvas® is the learning management system used at the university.

Items Measuring Demographics

D1 My teaching status at the university is best characterized as:
- ❍ Tenured
- ❍ Tenure-Track
- ❍ Term
- ❍ Adjunct
- ❍ Other

D2 What is your gender?
- ❍ Male
- ❍ Female
- ❍ Transgender
- ❍ Prefer not to disclose

D3 What is your age range?
- ❍ 18-22
- ❍ 23-29
- ❍ 30-39
- ❍ 40-49
- ❍ 50-59
- ❍ 60-69
- ❍ 70+

D4 How many years of teaching have you completed?
❍ 0-2
❍ 3-5
❍ 6-10
❍ 11-15
❍ 16-20
❍ 21-25
❍ 26+

D5 I teach (or most recently have taught) primarily:
❍ Face-to-Face (Classroom)
❍ Online
❍ Blended (combination of online and face-to-face)

D6 The university level I primarily teach is:
❍ Undergraduate
❍ Graduate (Masters)
❍ Graduate (Doctoral)
❍ Graduate (Law)

D7 The area of the university I primarily teach in is:
❍ College of Arts and Sciences
❍ School of Education
❍ School of Law
❍ School of Management
❍ School of Nursing and Health Professions
❍ Branch Campuses
❍ Online Education
❍ Other: Please indicate the discipline(s) you teach ____________________

D8 The location I primarily teach is
- ❍ Main
- ❍ Downtown
- ❍ Extension
- ❍ Branch

D9 Have you completed training related to use of Canvas ® previously?
- ❍ I have taken a Canvas ® training class here at the university
- ❍ I have taken a Canvas ® training class somewhere other than at the university
- ❍ I have taken a Canvas ® training class online
- ❍ I have obtained Canvas ® reference materials from the CIT website
- ❍ I have NOT previously taken a Canvas ® training class

D10 Which of the following (if any) would increase your intent to use technology for feedback purposes?
- ❍ Taking one training course
- ❍ Taking a training course once per semester
- ❍ Taking training courses twice per semester
- ❍ Taking training courses once per year
- ❍ Training would not increase the likelihood that I would use technology for feedback purposes

Questionnaire Items & Construct Mapping

Construct: behavioral intent to use (intent)

Q2 I use technology as much as possible when teaching a blended/hybrid course (blended/hybrid courses may incorporate both face-to-face and online instruction).
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (4)

Q27 I intend to use the Canvas® to provide text-based feedback to my students the next time the opportunity presents itself
Strongly agree (4)
Agree (3)
Disagree (3)
Strongly disagree (1)

Q29 I am willing to try new technologies when teaching my courses:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Construct: behavioral intent to use with multimedia - intent (media)

Q25 I intend to use Canvas® to provide audio feedback to my students the next time the opportunity presents itself:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q26 I intend to use the Canvas® to provide video feedback to my students the next time the opportunity presents itself:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Construct: frequency of use of audio- or video-based technologies (frequency)

Q3 How frequently do you:
Very frequently (4)
Somewhat Frequently (3)
Seldom (2)
Never (1)
3_2: Provide feedback to students on their writing or course assignment using electronic methods (such as track changes, comments in pdfs or Word) (2)
3_3: Provide written feedback to students on their writing or course assignment using electronic methods associated with Canvas® (such as the Rich Content Editor or Crocodocs) (3)
3_6: Provide audio-based feedback to students on their writing or course assignment using non Canvas® tools (example: an iPod recording or telephone voice mail) (6)

Q4 How frequently do you use Canvas® discussion board feature:
Very frequently (4)
Somewhat frequently (3)
Seldom (2)
Never (1)

Q6 How frequently do you use technology to provide feedback to students?
Very frequently (4)
Somewhat frequently (3)
Seldom (2)
Never (1)

Construct: Frequency of Use of technology with Multimedia – frequency (media)

3_4: Provide audio-based feedback to students on their writing or course assignment using Canvas® (4)
3_5: Provide video-based feedback to students on their writing or course assignment using Canvas® (5)

Construct: perceived ease of use (ease)

Q7 Please indicate your comfort level with technology when you are teaching at the university level:
Very comfortable (4)
Comfortable (3)
Uncomfortable (2)
Very uncomfortable (1)

Q13 Please indicate your agreement with the following statement: "I believe that technology is becoming easier to learn and use."

Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q16 Please indicate your agreement with the following statement: "It is easy for me to get Canvas® to do exactly what I need it to do"
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q32 I find it easy to provide text-based feedback on my student assignments WITHIN the Canvas® system (as opposed to downloading the assignments to the desktop):
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q33 I find it easy to use the discussion board tool in Canvas®:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Construct: perceived ease of use with multimedia – ease (media)

Q14 Please indicate your agreement with the following statement: "I often need to refer to the CIT online Canvas® help resource page"
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q15 Please indicate your agreement with the following statement: "I find it easy organize my course in Canvas®"
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q30 I find it easy to use the audio feedback tool in Canvas®:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q31 I find it easy to use the video feedback tool in Canvas®:
Strongly agree (1) - recoded to (4)
Agree (2) - recoded to (3)
Disagree (3) - recoded to (2)
Strongly disagree (4) - recoded to (1)

Construct: perception of self-efficacy to use technology (self-efficacy)

Q11 Please rate your skill level when using Canvas ® to mark up text-based documents (using the Canvas® Speedgrader)
Very skilled (5)
Skilled (4)
Somewhat skilled (3)
Not very skilled (2)
Not skilled at all (1)

Q12 Please rate your skill level when using the discussion board in Canvas® for the purpose of providing feedback to students
Very skilled (5)
Skilled (4)
Somewhat skilled (3)
Not very skilled (2)
Not skilled at all (1)

Q28 When it comes to technology please rate your ability to:
Very skilled (5)
Skilled (4)
Somewhat skilled (3)
Not very skilled (2)
Not skilled at all (1)
Question is actually 3 items
Learn new technologies
Use a wide range of different technologies
Use technology for use in the provision of feedback

Construct: perception of self-efficacy to use technology with multimedia - (self-efficacy (media)

Q8 Please rate your skill level when using Canvas® to record an audio message for the student
Very skilled (5)
Skilled (4)
Somewhat skilled (3)
Not very skilled (2)
Not skilled at all (1)

Q9 Please rate your skill level when using Canvas® to record a video message for the student
Very skilled (5)
Skilled (4)
Somewhat skilled (3)
Not very skilled (2)
Not skilled at all (1)

Q10 Please rate your skill level when using Canvas® to use the “speech to text recognition” feature
Very skilled (5)
Skilled (4)
Somewhat skilled (3)
Not very skilled (2)
Not skilled at all (1)

Construct: perceived usefulness (usefulness)

Q5 Please provide your level of agreement for each of the following:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)
Question is actually 5 items

5_1: Technology helps me do a better job in providing feedback to students
5_2: Technology makes it difficult to address the diverse needs of students in learning
5_3: Students produce better homework assignments when they use technology
5:4: As an instructor, I make better presentations when I use technology
5:5: Technology masks actual learning by making student deliverables appear better than they actually are

Q17 If I were to come across a new feature in Canvas®, I would try to figure out what it does and how to use it:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q18 I think that use of Canvas® for feedback may enable me to provide richer and more valuable feedback to my students:

Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q19 I think that use of Canvas® for feedback could increase my productivity:
Strongly agree to (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q20 I think that use of Canvas® for feedback may increase my effectiveness on the job:
Strongly agree to (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q21 I think that use of Canvas® for feedback may make my job easier:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q22 I think that learning how to use Canvas® for feedback may be useful in my job:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q23 I think that my students would find it useful if I used Canvas® to provide feedback to them:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)

Q24 I think that using technology for feedback purposes can be useful from the perspective of the student:
Strongly agree (4)
Agree (3)
Disagree (2)
Strongly disagree (1)