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**THE EFFECT OF SOCIAL PRESENCE ON TEACHER TECHNOLOGY  
ACCEPTANCE, CONTINUANCE INTENTION, AND PERFORMANCE IN AN  
ONLINE TEACHER PROFESSIONAL DEVELOPMENT COURSE**

by

JO ANN BRYANT SMITH  
B.A. University of Central Florida, 1982  
M.A. University of Central Florida, 2001

A dissertation submitted in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in the Department of Educational Research, Technology, and Leadership  
in the College of Education  
at the University of Central Florida  
Orlando, Florida

Fall Term  
2006

Major Professor: Stephen A. Sivo

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## **ABSTRACT**

The purpose of this study was to determine if the Technology Acceptance Model (TAM) could explain the relationship between teacher's acceptance of an online teacher professional development course and their continuance intentions regarding online teacher professional development (oTPD). This study focused on the perceptions of the teachers as opposed to the design or implementation of oTPD. The participants (N=517) were mostly teachers (88.8%) enrolled in a statewide online course to provide classroom teachers with the latest knowledge of research-based instructional reading strategies. The course was offered over a 10-14 week period during the Spring 2006 semester through a public state university. Structural equation modeling was used to create a path analytic model extending the TAM to include two additional constructs: sociability and social presence. In addition, gains in instructional reading strategies knowledge (performance) were examined. Using this expanded version of the TAM, the study examined the causal relationships between sociability, social presence, perceived usefulness, perceived ease of use, continuance intention, and gains. Online distance education research has indicated that social presence can influence post-secondary students' attitude and persistence within a web-based course. However a paucity of research exists on how technology acceptance and social presence impacts teachers within an online teacher professional development setting.

Path analysis, univariate analysis of variance, and independent t-tests in SPSS v12.0 for Windows were used to analyze the data. The results suggest that the hypothesized extended model was a good fit. The model did indicate that both perceived ease of use and perceived usefulness were determinants of teachers' intent to continue using oTPD for future professional development needs.

## ACKNOWLEDGMENTS

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I would like to dedicate this work to my parents, John Pascal and Esther Mason Bryant, for being my first teachers of life and love. To my loving and patient husband, Jeff, who encouraged me each day and took care of the household. To my three children, Kayla, Pascal and Reah, who continually prodded me to finish this research before their high school graduation. To my many friends who were there to help whenever I needed it. I give all the glory to God who continues to strengthen my spirit and feed my soul.

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## **CHAPTER ONE: INTRODUCTION**

“Who dares to teach must never cease to learn.”

-John Cotton Dana

### **Background and Introduction**

Advances and changes in access to information, technology, and the shifts in the demographics of the U.S. to a more diverse population have challenged both the novice and the experienced teacher to upgrade and gain new knowledge and skills that will best provide students an education that will sustain their futures. Newly developing areas of science and technology such as nanotechnology and biomedicine are just now being added to the K-12 curriculum. Teachers are tasked with the responsibility of providing students an education that will prepare them for future careers in fields that have yet to be invented (Thornburg, 1997). To accomplish this task, teachers themselves must be life-long learners to keep abreast of these emerging fields of science and technology.

The advances in educational technology are also changing the way teachers communicate and learn. The introduction of new technological tools and resources designed to support and enhance learning has allowed students and teachers at any geographic location and at any time to access new ways of learning and teaching in multiple content areas and in multiple formats; however, having these technological resources available does not mean they will be used, and the lack of use creates a loss of limited financial resources. The success of online technology for teacher professional development is dependent upon teachers' acceptance and use of web-based

technology to deliver professional development as an alternative to traditional face-to-face delivery.

### Importance of Teacher Professional Development

Studies have repeatedly demonstrated that the classroom teacher makes one of the most significant impacts on positive student academic achievement (Darling-Hammond, 2000; Sanders, Wright, & Horn, 1997; Wenglinsky, 2000; Whitehurst, 2002). Teacher professional development is often offered as in-service staff training for teachers that are already certified and are currently teaching or involved within a school setting. This is in contrast to pre-service teachers who may be enrolled in a teacher preparation course or university program, but have not yet received certification or taught in a classroom. Professional development refers to learning opportunities that engage teachers' in activities that will enhance and strengthen their practice.

The need for teacher professional development is rapidly increasing due to many factors within today's education arena. First, there is a critical teacher shortage in many urban geographic locations in the U.S. This shortage has prompted policy-makers and state leaders to lower the stringent teacher preparation requirements allowing less-trained teachers into the classrooms in order to fill vacancies in the schools (U.S. Department of Education, 2002). Online professional development is needed for these new teachers who find themselves in challenging classroom situations where students must be prepared to think critically and perform well on high stakes standardized tests. According to preliminary statistics from the National Center for Education Statistics (NCES), in 2004-2005 at least 27 percent of the nation's schools did not meet the federal requirement for adequate yearly progress that is based partially on student

performance on standardized tests. Among individual states, Florida placed last with 72 percent of its schools failing to show enough improvement. Secondly, in addition to the placement of less-prepared teachers in the classroom to fill shortages, is the astounding attrition rate among new teachers. More than 50 percent of all new teachers leave the profession within the first five years of teaching (Darling-Hammond & Sykes, 2003; Ingersoll, 2001; 2003). This revolving door negatively impacts school effectiveness (Ingersoll, 2001). Much of this attrition has been blamed on the lack of mentoring and support from more experienced teachers during the induction phase of beginning teachers (Hawkey, 1997). Web-based instruction and online community networks have the potential to deliver professional development instruction and teacher induction support that will help raise the attrition rate, build quality teachers, and ultimately enhance student achievement (Swan, 2002; Wegerif, 1998).

There has been an accumulation of research in the area of teacher professional development that has shown evidence of both the failure of professional development to impact teachers (Corcoran, 1995; Frechtling, Sharp, Carey & Baden-Kierman, 1995; Guskey & Huberman, 1995) and research that has attested to the success of professional development (Carpenter, Fennema, Peterson, Chiang, & Loef, 1989; Cobb, Wood, Yackel, Nicholls, Wheatley, Trigatti, & Perlwitz, 1991; McCutchen, Abbott, Green, Beretvas, Cox, Quiroga et al., 2002). For quality professional development that improves student achievement the content must apply directly to the teacher's classroom teaching (Holland, 2005). Guskey (2000) clearly points out the simple fact that "one constant finding in the research literature is that notable improvements in education almost never take place in the absence of professional development...Hence, although professional development itself may be insufficient to bring

about significant improvement in education, it is an absolutely necessary ingredient in all educational improvement efforts” (p.4). Professional development is critical for school reform and for it to be effective it must enhance teachers’ knowledge and skills (Garet, Porter, & Desimone, 2001; Holland, 2005; Schlager & Fusco, 2003).

To help PK-12 students achieve high standards of learning it is important that teachers continue to expand their skills through engagement in continuous professional development. The National Education Association Foundation for the Improvement of Education report (1996) entitled “Teachers Take Charge of Their Learning: Transforming Professional Development for Student Success” recommended four necessary actions for school transformation:

- Find time for continuous professional development. To keep up with change, teachers need the time to collaborate with their colleagues and to update their knowledge and skills-as professionals in other fields are required to do.
- Help teachers assume responsibility for their own professional development and for ensuring teacher quality.
- Develop partnerships to enhance teachers' knowledge and skills, including partnerships with parents (their most important partners), higher education institutions, museums, libraries, and businesses.
- Reallocate existing and appropriate new revenues sufficient to guarantee standards-referenced, quality teaching and learning in every public school.

This report emphasized continuous teacher learning as the key to increasing student achieve and that the education profession should take the responsibility for creating a culture of continuous learning as an integral part of a teacher's career (Rényi, 1996).

### Online Teacher Professional Development

With the passage of the No Child Left Behind (NCLB) Act of 2001 came the requirement for local educational agencies to provide a high-quality teacher in every classroom in the United States. In order for educational agencies to reach this goal, much will need to be accomplished through in-service teacher professional development that can be made available for all teachers, at anytime, and from anywhere. Asynchronous online learning, defined as instructional content delivered by electronic technologies including the Internet, shows great promise. Delivering professional development online will help meet the critical need for teacher professional development. This fact makes the study of technology acceptance, including the impact of social presence and sociability on the usability of such systems, a valuable contribution to the field of teacher professional development and therefore, worthwhile to educators and policy-makers. One of the most advantageous aspects to online learning is that it allows the learner flexible access at anytime and from any location (Cole, 2000).

A recent survey conducted by the Education Leadership Program at George Mason University provided a snapshot of online professional development the United States. Thirty percent of respondents said they were currently accessing online professional development. Forty percent said their school or district would consider delivering professional development online and six percent wanted only face-to-face training. The three most important characteristics

ranked by technology decision-makers when selecting online professional development materials were first content relevance, second content quality, and third cost (McDonald, 2005).

The U.S. Department of Education is also supporting and developing opportunities for classroom teachers to enhance their skills and knowledge through online training. The U.S. Secretary of Education, Margaret Spellings, in 2005 stated:

We want to provide teachers with strategies that are proven to work. And teachers want to hear from other teachers who are getting real results in the classroom. That's why professional development through e-learning is such an important part of the No Child Left Behind Act. (U.S. Department of Education, 2005a)

Online teacher professional development offers support to teachers in isolated geographic areas where school districts may have limited resources to pull teachers out of the classroom and provide a classroom substitute while paying for a teacher's travel and lodging near a school district office to receive professional development. Small school districts and rural areas also may have difficulty obtaining teacher instructors that are capable of providing inservice professional development for higher-level academic courses such as physics or calculus.

Online teacher professional development is a rapidly growing phenomenon (Whitehouse, Breit, McCloskey, Ketelhut, & Dede, 2006). Many online teacher professional development (oTPD) programs available are funded through federal grants or developed by private educational companies and offered to districts and schools at a cost. Already 33 states have invested in the development and delivery of online teacher professional development (U.S. Department of Education, 2005b).

Several oTPDs have been developed and are available to teachers at anytime and anywhere. The U.S. Department of Education provides free teacher professional development

through the Teacher-to-Teacher Initiative that can be accessed via the Internet at:

<http://www.ed.gov/teachers/how/tools/initiative/index.html>. Through this initiative teachers are able to earn professional development credit for participating in the Teacher-to-Teacher workshops and e-learning through their own school district or state. The Harvard Graduate School of Education has developed an international online teacher professional resource for PK-12 teachers. The program is called WIDE World (Wide-scale Interactive Development for Educators). WIDE courses incorporate and model multiple methods in their delivery of professional development to teachers. Courses are designed to improve teacher knowledge and understanding in an online community-learning environment. Another online professional development source is the PBS TeacherLine, funded by a grant from the U.S. Department of Education. TeacherLine provides online professional development to teachers through facilitated standards-based courses, collaborative learning communities, and internet-based resources. More than 90 courses in mathematics, reading, instructional technology, instructional strategies, science, and curriculum mapping are currently being offered through PBS TeacherLine.

The online professional development programs that have been highlighted are just a few of the programs available in the United States. Online teacher professional development requires significant amounts of financial resources and commitment—it is not enough to have these resources available—the use of such technologies is dependent upon teachers' acceptance of the technology.

## Importance of Technology Acceptance

The availability of online teacher professional development does not guarantee the use of this technology. Use by teachers is dependent upon their acceptance of the use of web-based technology to deliver professional development as an alternative to traditional face-to-face delivery. The study of technology adoption is important to prevent the underutilization or failure of online teacher professional development systems and to improve our understanding of how to best approach and design online professional development that creates learning conditions that will be embraced by classroom teachers (Davis, Bagozzi, & Warshaw, 1989; Ong, Lai, & Wang, 2004; Zhao & Cziko, 2001). There has been a considerable amount of research on the theory of technology acceptance in fields such as business, engineering, and education that supports the notion that perceived usefulness and ease of use are determinants of a user's intention to adopt new technology (Han, 2003; Lee, Kozar & Larsen, 2003; Szajna, 1994; Taylor & Todd, 1995a, 1995b; Venkatesh, Morris, Davis & Davis, 2003). The Theory of Reasoned Action and the Theory of Planned Behavior are two models developed through research to examine the acceptance of technology. This study applied the Technology Acceptance Model (TAM) to explain the relationship between teachers' acceptance of an online teacher professional development course, and their behavioral intention to continue to use oTPD in the future. In addition, the TAM was extended to include two external constructs: sociability and social presence. The TAM was also extended with an additional dependent variable: gains. Using this expanded version of the TAM, the study examined the causal relationships between sociability, social presence, perceived usefulness, perceived ease of use, continuous intention, and gains.

## Importance of Social Presence

Gunawardena and Zittle (1997) have found that social presence influences the satisfaction of online learners with their learning. Arbaugh (2001) also found that immediacy behaviors were one of the social presence factors that positively correlated to student learning. Muirhead and Betz (2002, p. 75) state that “research studies reveal that the quality of online education classes varies considerably due to instructors who fail to provide timely and consistent feedback to their students.” Other studies have also concluded that teacher presence established through interaction or immediacy behaviors is an especially important issue for online education effectiveness (Anderson, Rourke, Garrison, & Archer, 2001; Garrison, Anderson, & Archer, 2001; Richardson & Swan, 2003; Shea, Pickett, & Pelz, 2003; Wilson & Stacey, 2003). Studies conducted with college students have shown that social presence has a significant impact on student persistence, satisfaction, improved learning, and collaboration (Garrison & Anderson, 2003; Gunawardena & Zittle, 1997; Hackman & Walker, 1990; Richardson & Swan, 2003; Tu, 2002a). However, the dynamics of a group of college students and a group of professional classroom teachers may differ widely in respects to interactions, experiences, applications of instruction, and motivation. The theory of social presence could play a more or a less significant role in the online teacher professional development environment.

## Purpose and Objectives of the Study

The purpose of this study is to examine teachers' technology acceptance of online teacher professional development (oTPD) and how it affects their perceptions of ease of use, usefulness, continuance intention, and gains (performance) in an online teacher professional development

course. The Technology Acceptance Model (TAM), first introduced by Davis (1986), is one of the most parsimonious and powerful theoretical models used to determine an individual's acceptance of a technologically-based system and are founded on two major variables: perceived usefulness (PU) and perceived ease of use (PEOU) (Lee, Kozar & Larsen, 2003; Lucas & Spitler, 1999; Venkatesh & Davis, 2000). In this study the model was expanded to encompass sociability and social presence and its impact on perceived usefulness and perceived ease of use.

The theoretical foundation of social presence is another body of literature in the realm of online distance education research that has indicated a significant influence on post-secondary students' persistence and satisfaction within web-based courses (Arbaugh, 2001; Richardson & Swan, 2003). However, conflicting results have also been reported suggesting that social presence has no significant impact on student satisfaction and persistence (Wise, 2004).

Literature remains scarce in regards to online social presence and its relevancy in the context of online teacher professional development (Whitehouse et al., 2006). In one study of teachers using a statewide educational telecomputing network, the researcher suggests that network facilitators should use strategies that would increase the social interactions of the users to "enhance perceptions of the systems' social presence" (Anderson & Harris, 1997, p. 19). It is important that we gain a better understanding of how online learning can be used in teacher professional development. The primary goal of this study is to contribute to the understanding of this phenomenon in order to assist educational and policy decision makers as to how and what is needed to provide better extensive training using online web-based instructional delivery. What are the major factors that affect teachers' acceptance and intentions to continuing using oTPD? Does online teacher professional development positively impact teacher's knowledge? How does social presence and sociability influence teachers' perceptions or intent to continue using oTPD?

This study has been designed to investigate how the TAM measures the continuance intention of teachers to use oTPD. If the utilization of the TAM demonstrates favorable results, school district professional development administrators should be encouraged to make the most of online professional development as an essential component of their professional development plan.

### Research Questions

This research study is primarily directed at online asynchronous learning defined as the delivery of a learning or education program by electronic means using multiple media techniques. This study extended the TAM to examine the direct effect of social presence on perceived usefulness and the direct and indirect effect on continuance intention. Sociability was also examined to determine its impact on social presence and perceived ease of use. Figure 1 provides a depiction of the extended TAM proposed in this study. The study focused on answering the following research questions:

1. Does the overall hypothesized Technology Acceptance Model (TAM) fit the data in predicting teachers' continuance intention to use online Teacher Professional Development (oTPD)?
2. To what extent does sociability and social presence impact the TAM?
3. To what extent does social presence impact knowledge gains in an oTPD based program?

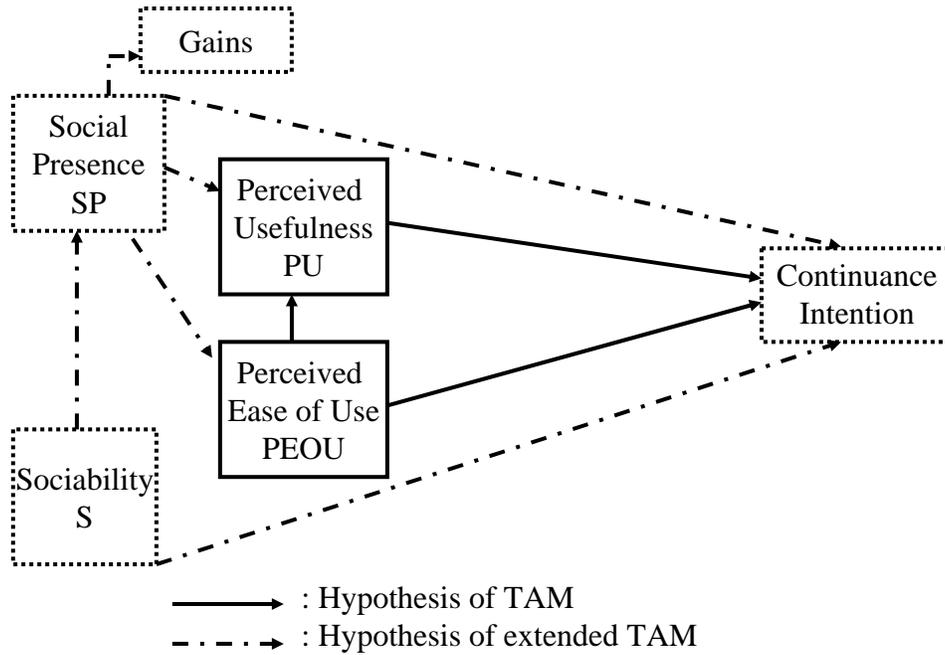


Figure 1. The Hypothesized Technology Acceptance Model.

### Relevance of the Study

A significant amount of research has shown that technology acceptance is a key component if a newly adopted system is going to be used by the intended audience (Venkatesh, & Davis, 2000). The expansion of online teacher professional development has been significant over the past five years. Such online learning tools require a significant amount of financial and human resources. However, little is known about the true effectiveness on teachers when using web-based learning for teacher professional development. In addition, little research has been conducted to explore how well teachers accept the use of technology to improve their instructional quality and content knowledge in their classrooms. Online professional development offers enormous benefits by providing better access and a broader range of teacher

professional development opportunities to teachers in isolated areas. Online professional development also eliminates time constraints since the amount of time teachers can dedicate to professional development is decreasing due to the increase of student performance accountability, expansion of class sizes, and the greater demands made in providing a more stringent and rigorous level of instruction. This study will help educational leaders and administrators gain a better understanding of the intended use and adoption of technology from the perspective of the classroom teacher in an online professional development setting. In addition, this research increases the growing body of knowledge of the post-adoption phase, discovering what variables are the best predictors of continued use of oTPD.

### Study Limitations

The participants were members of an intact group and as in most educational settings; the ability to use a randomization process was beyond the control of the researcher. The study was conducted on a single teacher professional development program in reading and used only one type of online delivery method and management system. In addition, participants in the program were predominantly female and full-time teachers. These factors will limit the generalizability of the study in other contexts.

Although the correlational method can ascertain a relationship, it cannot determine an absolute cause-effect relationship between variables that are correlated. The absence of a controlled experimental design with a control group often limits the ability of the research study to determine causation. Even so the lack of control group did not create a threat to internal

validity since this study examined a particular phenomenon within a particular context and is not comparing results among different settings.

This study considered the perceptions of those teachers enrolled in a single online teacher professional development course and those who responded to the questionnaire. There was no attempt to obtain the experiences and perceptions of those students who did not respond to the questionnaire.

The basic statistic in structural equation modeling (SEM) is covariance. Researchers express disagreement on whether SEM is a causal model, although there appears to be some agreement that under particular circumstances SEM can represent causal relationships (Kerlinger & Pedhazur, 1973; Pearl, 2000; Raykov & Penev, 2001). However, most experts would not say that testing the fit of a SEM is a test of causality, even though most SEM users are interested in causal modeling (Nachtigall, Kroehne, Funke, & Steyer, 2003). Correlation itself does not imply causation, but as the structural model hypothesized in this study has been constructed based on theories that specify causal relationship between variables within the proposed model, a correlation between the variables can be interpreted as corroborative evidence (Pearl, 2002).

### Assumptions

Some of the underlying assumptions in the study include:

1. The participants' of the study responded honestly to the questionnaire items.
2. The participants' answered the questionnaire without interference or influence of other study participants.

3. The participants' answers were based on their own perceptions and beliefs concerning their experience with the online professional development course.
4. The electronic questionnaire was secured to ensure the validity and reliability of the results was accurate.
5. The participants comprehended the terminology in the questionnaire without biases based on gender or ethnicity.
6. The participants were able to access the questionnaire.
7. Economic constraint was not a factor for teachers to enroll in the online course nor was it a consideration for the adoption or participation of future online professional development courses.
8. All endogenous variables were assessed on an interval level of measurement.
9. Relationships between the variables were linear and additive, not curvilinear or interactive.
10. Variables were free of multicollinearity. Not having a strong correlation with another variable (above .80).

### Organization of the Dissertation

A brief summary of the literature related to the research focus of this study is contained in Chapter 2 and places the present study in the context of previous research to support the basis of the theoretical framework of the study. Chapter 3 contains the research methodology used in this study, such as sampling, description of the subjects, data collection procedures, data analysis and includes the basis for the purposive sampling and the development of the questionnaire. In

addition, a detailed description of the Florida Online Reading Professional Development (FOR-PD) course is provided in this section since it is the course used in this study. Chapter 4 presents the results of the study. Chapter 5 provides a summary of the findings, discussion of the significance, conclusions and recommendations based on the results of this research.

### Definition of Terms

Numerous terms have been used for online learning, making it difficult to select a term that is universal and a definition that is standard. The term online learning will be used throughout this study synonymously with other common terms such as distance learning, web-based learning, internet learning, e-learning, computer mediated learning, distributed learning, computer-assisted learning, and computer-based learning.

Asynchronous online learning: In online learning, this is when the participants do not need to be logged into the course at the same time. For example, the online facilitator may require all students to write a reflective response to questions that are posted online and to respond to the postings when their schedules permit.

Actual System Use: Measuring the actual behavioral response by the individual's action in reality as opposed to relying on an individual's self-reported recollection of system use (Davis, 1989).

Computer-Based Training: Refers to courses presented on a computer, but does not necessarily mean that the course is connected to a network. Learners can usually pace themselves. A record of work completed may also be saved on the computer (National Staff Development Council, n.d.).

Continuance Intention: As opposed to the initial adoption (acceptance) of technology, continuance intention is the subsequent continued usage (continuance) of technology. In this study it refers to teachers who intend to continue using oTPD in the future.

Facilitator: In this study the facilitator is accessed online and supports students participating in the online professional development course. The facilitator purpose is solely to facilitate the course and support interaction. The facilitator is not involved in the instructional design of the course or the content requirements.

Interaction: Wagner (1994) defines interaction as “simply stated, interactions are reciprocal events that require at least two objects and two actions. Interactions occur when these objects and events mutually influence one another” (p. 8).

Multimedia: Integration of several forms of media, such as text, graphics, animation, video, sound, etc. (National Staff Development Council, n.d.).

Online Teacher Professional Development (oTPD): Teacher professional development that is delivered through a web-based course or computer-based system.

Perceived Ease of Use: Refers to the degree to which the individual believes that using the target system would be free of mental and physical efforts (Davis, 1993, p. 477).

Perceived Usefulness: Refers to the degree to which an individual believes that use of the target system could enhance the job performance (Davis, 1993, p. 477).

Social Presence – The degree of salience of another person in an interaction and the consequent salience of an interpersonal relationship (Short, Williams, & Christie, 1976; Tu, 2000; Tu & McIsaac, 2002; Walther & Burgoon, 1992). Social presence is defined as the extent to which a medium allows a user to experience others as being psychologically present (Fulk, Steinfield, Schmitz, & Power, 1987).

Sociability: Kreijns, Kirschner, Jochems, and Van Buuren (2004a) define sociability “to be the extent the CSCL environment is able to give rise to . . . a social space or more precisely, the extent to which a CSCL environment is able to facilitate the emergence of a social space” (p. 157).

Streaming Audio/Streaming Video: Audio or video that is immediately played by your computer as it is downloaded from the Internet to your computer and is viewed much like the image and sound on a television set (National Staff Development Council, n.d.).

Synchronous online learning: An event in which all of the participants are online at the same time and communicating with each other. For example, an instructor might schedule a guest lecturer to take questions at a particular time; all interested people would connect with the lecture when the guest is online (National Staff Development Council).

Teacher Presence: Anderson, Rourke, Garrison, and Archer (2001) define teaching presence as “the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes” (p. 5).

Teacher Professional Development: For the purposes of this study teacher professional development will be used primarily as in-service staff training. Professional development refers to learning opportunities that engage teachers' in activities that will enhance and strengthen their practice (Guskey, 2000).

Technology Acceptance: As used in this research study it is defined as the degree or extent which teachers use online teacher professional development and intend to continue to use this technology for their individual professional development.

Technology-Based Instruction: Training that occurs through the media. This could include computers, telephone, television, audiotape, videotape, and print (National Staff Development Council, n.d.).

Web-Based Training: A form of computer-based training in which course material is accessed on an intranet or Internet and may be linked to learning resources outside of the course. For example, there may be links to references, e-mail, discussions, and videoconferencing. A record of work completed by each learner may also be saved on the server offering the course (National Staff Development Council, n.d.).

Definitions of the terms used to describe the structural equation modeling procedures used in this study are:

Adjusted Goodness of Fit Index (AGFI): The AGFI is a fit model index that accounts for the degrees of freedom available for testing the model. Conventional criteria suggest values above 0.90 are acceptable. Within covariance-based SEM, statistic measuring the absolute fit (unadjusted for degrees of freedom) of the combined measurement and structural model to the data (Gefen, Straub, & Boudreau, 2000).

Analysis of variance (ANOVA): The analysis of the total variability of a set of data (measured by their total sum of squares) into components that can be attributed to different sources of variation. The sources of variation include those caused by random fluctuations, and those caused by systematic differences between groups. (Washington, Leonard, Manning, Roberts, Williams, Bacchus, et al., n.d.)

Comparative Fit Index (CFI): A variant of factor analysis where the goal is to test specific theoretical expectations about the structure of a set of measures. The CFI and is also referred to

as the Relative Noncentrality Index (RNI) with an upper bound set to 0.0. Values close to 1.0 indicate a good fit (Bentler, 1990).

Collinearity: a.k.a. multicollinearity: Multicollinearity refers to linear inter-correlation among variables which makes it difficult to interpret the results and the individual effect of each variable. The issue with this type of data redundancy is that of overfitting in regression analysis models. LISREL assumes that all the IVs are independent of each other, at once (Gefen et al., 2000).

Cronbach Alpha Coefficient: Commonly used measure of reliability for a set of two or more construct indicators. Values range between 0 and 1.0, with higher values indicating higher reliability among the indicators (Gefen et al., 2000).

Degrees of freedom: Degrees of freedom (df) is a measure of the precision of estimated variability and is the number of independent components of information. For a simple recursive path analytic model it is the number of data points used in the analysis, minus the number of parameter estimated. The more parameters estimated the less degrees of freedom are available (Hatcher, 1994).

Latent variable: A research construct that is not observable or measured directly, but is measured indirectly through observable variables that reflect or form the construct (Gefen et al., 2000).

LISREL: A procedure for the analysis of LInear Structural RELations among one or more sets of variables and variates. It examines the covariance structures of the variables and variates included in the model under consideration. LISREL permits both confirmatory factory analysis and the analysis of path models with multiple sets of data in a simultaneous analysis (Gefen et al., 2000).

Partial Least Squares (PLS): A second generation regression model that combines a factor analysis with linear regressions, making only minimal distribution assumptions (Gefen et al., 2000).

RMSEA: The Root Mean Square Error of Approximation is used to measure the predictive error (precision and bias) to describe the predictive performance of the theoretical model. These quantities can be used to compare prediction methods to absolute standards or to one another (Sheiner & Beal, 1981). The optimal value for small sample size (N=159) is around .06 and for large sample size (N=2,500) it may be .02 (Sivo, Fan, Witta, & Willse, 2006).

R-square or R2: Coefficient of determination. A measure of the proportion of the variance of the dependent variable about its mean that is explained by the independent variable(s). R-square is derived from the F statistic. This statistic is usually employed in linear regression analysis and PLS (Gefen et al., 2000).

Root Mean Square Residual (RMR): Within covariance-based SEM, statistic assessing the residual variance of the observed variables and how the residual variance of one variable correlates with the residual variance of the other items (Gefen et al., 2000).

Structural Equation Modeling (SEM): Structural equation modeling (SEM) is a multivariate statistical technique used to examine direct and indirect relationships between one or more independent variables and one or more dependent variables. The variables in the model may be continuous or discrete. SEM is also referred to as causal modeling, causal analysis, simultaneous equation modeling, analysis of covariance structures, path analysis, dependence analysis, or confirmatory factor analysis (CFA) (Statnotes, n.d.).

## CHAPTER TWO: LITERATURE REVIEW

### Introduction

This chapter presents three relevant reviews of literature. The first review focuses on the literature surrounding online education and online teacher professional development (oTPD). This literature is pertinent to this study as it describes the foundation of online learning, as well as, the importance and current status of online teacher professional development. The second review pertains to the Technology Acceptance Model (TAM). This literature review gives an overview of the three major theoretical models related to technology acceptance. A more descriptive detail of TAM is provided in this review, as it is the model applied within this study. The third review section presents an overview of research relevant to social presence theory and sociability in online learning. Literature on online distance education research suggests that social presence has a significant influence on post-secondary students' satisfaction and performance within online courses (Arbaugh, 2001, Gelderman, 1998; Picciano, 2002; Richardson & Swan, 2003). The final section summarizes chapter two and highlights the significant contributions of this research to teacher professional development.

### Online Education: Background

In its most practical form the definition for distance education or online learning can be found in the Dooley, Linder and Dooley's book entitled *Advanced Methods in Distance Education* (2005). "Distance education is the application of delivery strategies using a variety of

delivery methods with learners who are constrained by time/space/lifestyle” (p 80). Keegan (2000) defined distance education as:

- the separation of teacher and learner (distinguishing it from face-to-face education),
- influence of an educational organization (distinguishing it from private study),
- use of technical media including the web and provision of two-way communication (distinguishing it from other uses of educational technology) and
- students taught as individuals rather than as a group.

However, the definition of distance education is not that simple as it is continually evolving with the new advances in technology, and these new advances are challenging educators to broaden and re-conceptualize their ideas of learning at a distance. The terminology itself varies among researchers in the field of technology education and other fields such as medical and engineering education.

The advent of the Internet brought new opportunities for teaching and learning (Gunawardena & McIsaac, 2003; Saade & Bahli, 2005). It is not unusual for most educators to link distance education to advances in technology such as the Internet (Garrison & Shale, 1987). Technology innovations have had a dramatic impact on distance education, and most distance learning programs rely on the available technologies that are cost effective to reach people who are not geographically, financially, or physically able to attend a traditional classroom (McIsaac & Gunawardena, 1996). One of the major benefits and features supported by computer technologies is the ability to provide asynchronous instruction. The time-independent feature allows students accessibility to the instruction 24 hours a day, seven days a week. In addition, computer technologies can integrate the use of audio, video, graphic, and data communications with the instruction providing an assortment of multimedia tools for instructional designers.

Online instruction basically supports three types of on-line services: electronic mail (e-mail), computer conferencing, and on-line databases (McIsaac & Gunawardena, 1996). Web-based systems are able to support group or computer conferencing communication as opposed to services that can only be accessed by individuals. One of the benefits of conferencing systems is that they support a range of facilities that enhance group communication and information retrieval. These include directories of users and conferences, access to databases, conference management tools, search facilities, polling options, cooperative authoring, and the ability to customize the system with special commands for particular groups (Kaye, 1989). In most cases all these features are supported in an online learning environment through learning support system platforms such as WebCT or Blackboard.

Olson and Wisner (2002) describe web-based education as “unparalleled access to instructional resources, far surpassing the reach of the traditional classroom” (p. 2). Web-based courses are quickly becoming a common form of online learning used today. The number of students enrolled in online courses increased from 1.98 million in 2003 to 2.35 million in 2004 (Allen & Seaman, 2005). Online universities such as the University of Phoenix and Nova University offer complete degree programs using web-based instruction and the same approach is being used by state-supported Virtual Schools.

### Current Research Impacting Online Learning

In the early years of online learning research, studies were predominately comparison studies of face-to-face classroom instruction vs. instruction at a distance. The conclusion of those studies has indicated “no significant difference” between classroom instruction and online

learning. One recent example is a study by Johnson, Aragon, Shaik, and Palma-Rivas (2000). The researchers compared learning outcomes of an online course with a similar course taught face-to-face; the results indicated that there was no difference between the two course formats in several measures of learning outcomes (Johnson et al., 2000, p. 29). Salomon (1981) and Clark (1989, 1994) have both argued that instructional design, and not the medium, is the key to effective learning. Mayer (2003) goes further to say that it is important how instructors use the medium to make the impact of the instruction more effective. Research studies on the various media methods in distance education have supported Clark's (1983) analogy of media "not influencing learning any more than the truck that delivers groceries influences the nutrition of a community" (p. 3) and reinforcing the idea that learning is more affected by instructional content than by the mode of instructional delivery. Numerous studies show no significant differences in student performance when comparing education in the classroom with technologically delivered classes (Beare, 1989; McCleary & Eagan, 1989; Russell, 1999).

In more recent years researchers have begun to look beyond comparisons into the deeper core issues of instructional interaction, technology acceptance, social context, learner characteristics, satisfaction and control. New online technological advances provide opportunities for researchers to add new knowledge as to the best strategies associated with the integration of these technologies to enhance instruction, learning, and the social interactions between educators and their students (Bonk, Hara, Dennen, Malikowski, & Supplee, 2000). The purpose of this section is to highlight some of the major research studies that have created new insights into distance education and have made an impact in the field of online learning.

One focus of research has been on student success and persistence in online learning. Powell, Conway, & Ross (1990) created a conceptual framework consisting of three categories:

- (1) Predisposing characteristics - prior education, socio-economic and demographic status, and motivational and other personal attributes.
- (2) Life changes - personal illness, relocation, altered employment status, and family problems.
- (3) Institutional - quality and difficulty of instructional materials, access to and quality of tutorial support, and the administrative and other support service provided.

The purpose of this framework was to increase the understanding of those variables associated with persistence and non-persistence. Powell et al. (1990) used a sample of adult learners to conduct an exploratory study investigated the relationships among adult students' preferred learning styles, perception of barriers to completion, and the successful completion of baccalaureate degrees pursued at a distance. The findings indicated that both perception of barriers and learning style were determinants of persistence and that learning styles had only a small amount of the variance to course completion. Billings (1988) conducted a study that also examined differences of completers and non-completers of online courses and indicated that student intentions was consistently the "best predictors of dropout in attrition studies...and in progress toward completion of correspondence courses" (p. 30).

Online distance education research has also indicated that social presence can influence post-secondary students' satisfaction and persistence within a web-based course (Arbaugh, 2001, Richardson & Swan, 2003). Persistence has also been linked to locus of control (Altmann & Arambasich, 1982; Rotter, 1989) and has been a concern of distance educators as they try to identify specific criteria that will predict student successful completion of an online course. Other research in distance education has questioned whether large amounts of student-instructor interaction actually interfere with the independence of the learner (Keegan, 1988; Lewis, 1988).

Baynton (1992) developed a model and used factor analysis to confirm the three factors that may affect a student's concept of control: learner's independence or their opportunity to make choices; competence, ability and skill; and both human and material support.

Over the past ten years distance education has been based on theoretical foundations in distance education such as social presence, mentioned earlier. Gunawardena (1995) has studied social presence theory in computer-mediated conferencing. Aragon (2003) states that Rourke and others researchers suggest, "high levels of social presence create a learning environment that is perceived as warm, collegial, and approachable" (p. 60). Research in the area of social interactions, specifically the three major types within the context of web-based instruction, was introduced by Moore in 1989 and encompassed learner-content interactions, learner-instructor interactions and learner-learner interactions (Moore, 1989).

Numerous research studies that have focused on learning styles and the media approach in distance education were conducted by Davie (1987). Davie examined the interaction of learning style and computer mediated communication. He used the Kolb Learning Style Inventory (LSI) instrument to determine learner characteristics, attempting to examine learning style variables and the media and methods used in distance education. Canfield (1983) also developed a learning style inventory that was later used in a study by Verduin and Clark (1991) to examine learning styles in distance education. This information helped distance educators understand how to accommodate and consider different individual learning styles when making instructional decisions in course content and design.

Other research in distance education was conducted to examine the levels of learner feedback (Howard, 1987; McCleary & Eagan, 1989). Howard (1987) lists learner feedback as one of the most important components in effective course design. McCleary and Eagan (1989)

conducted a study that showed that improving feedback resulted in higher course rating by students.

Research similar and related to instructor feedback is in the area of interaction in asynchronous computer conferencing. McDonald and Gibson (1998) concluded that the participants could interact in groups to resolve interpersonal issues in an asynchronous learning environment (McDonald & Gibson, 1998). A study grounded in Moore's theory of independent learning and interaction in distance education was conducted in a synchronous videoconferencing environment. Chen and Willits (1999) indicated that interaction is multidimensional and involves "in-class discussion, out-of-class electronic communication, and out-of-class face-to-face interaction" (p. 61).

Other studies currently being conducted examine the interaction of learners and delivery media. Research on the Jasper Woodbury Project consisted of a series of audio and visual images to create authentic situations where students felt they were solving problems based in a real-world context. The results of the experiment indicated significant gains students made using video-based instruction over those using text-based instruction (Van Haneghan, Barron, Young, Williams, Vye & Bransford, 1992). Researchers continue to conduct cognitive research to examine the interaction between computer technology and student learning.

### Teacher Online Professional Development

Teacher professional development seeks to instruct teachers in pedagogy as well as content (Loughran & Russell, 1997). Online teacher professional development provides easier access, flexibility, lower costs over time, and opportunities for teachers to build collaboration

and interaction. The term "online" refers to instruction delivered via the web. The number of oTPD resources are staggering and multiplying. Professional development online allows all teachers to keep pace with emerging new knowledge in their content areas, as well as relevant pedagogies and technologies (Tinker, 2000).

Requirements of No Child Left Behind (NCLB) (2001), the aging teacher population on the crest of retirement, and the 50 percent attrition rate within five years of teachers entering the field of classroom teaching; are all creating an increased need for oTPD (Darling-Hammond & Sykes, 2003; Ingersoll, 2001, 2003). Technological advances are providing increased accessibility for teachers to engage in teacher professional development anytime and anywhere (Dede, 2006).

The National Staff Development Council and National Institute for Community Innovations (2001) listed some of the following reasons why online teacher professional development appears to be expanding so quickly:

- Most states require teachers and principals to earn continuing education units (CEUs) to renew their teaching and administrative licenses or certificates.
- The call for continued professional learning among educators is increasing as states increase their accountability for schools and districts.
- The importance of staff development as a key process to improve student achievement is more widely accepted.
- Schools and districts are increasing their professional development opportunities – and especially those that are flexible, convenient, cost effective, and that use the newly installed technology infrastructure in schools.

- One hundred percent of the U.S. public schools have Internet connections (Lazarus, Wainer & Lipper, 2005).
- Education and training is the second largest sector of the U.S. economy and represents the second largest expenditure behind healthcare (Web-based Commission on Education, 2000).
- Teachers report a significant lack of training and preparation in technology use (Technology Counts 2001).
- The current value of the e-learning market in the U.S. is \$10.02 billion and it is expected to reach \$38.1 billion by 2011 with PK-12 as the fastest segment of market growth (Ambient Insight, 2006).

The rate of growth in the development and availability of online teacher professional development has been phenomenal and yet a paucity of research exists that informs the field of the effectiveness or satisfaction of such online training (Whitehouse et al., 2006). In the introduction of a recently published manuscript, Dede (2006) describes the status of research available on oTPD:

Currently many initiatives in online teacher professional development are serving large numbers of educators. However, while such programs are propagating rapidly and consuming substantial resources both fiscally and logically, little is know about best practices for the design and implementation of these alternative models for professional enhancement. (p. 2)

While educational leaders would like to continue increasing the availability of online teacher professional development, they need to better understand how teachers' perceptions impact the continued use of the technology and its effectiveness.

## Technology Acceptance Theory

This study focuses on classroom teachers' intention to adopt and use new technology, specifically the adoption of online teacher professional development (oTPD). The success of online technology for teacher professional development is dependent upon teachers' acceptance of the use of web-based technology to deliver professional development as an alternative to traditional face-to-face delivery. The study of technology adoption research is important to prevent the underutilization or failure of online teacher professional development systems and to improve our understanding of how to best design online professional development to create learning conditions that will be accepted by classroom teachers (Davis et al., 1989; Ong et al., 2004; Zhao & Cziko, 2001).

Technology acceptance draws its roots from several fields of study: psychology, sociology, and information systems. The majority of these studies have been in the field of information systems research which is often focused on identifying the essential determinants impacting the behavior intentions of the system users (Davis et al., 1989; Davis 1993, Han, 2003; Igbaria 1993; Lee, Cho, Gay, Davidson & Ingrassia, 2003). The intention to use a technology is critical and has been well established in information systems literature as one of the strongest predictors of usage behavior in a variety of studies (Ajzen, 1991; Davis & Venkatesh, 2004; Sheppard, Hartwick, & Warshaw, 1988; Taylor & Todd 1995b). Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) was one of the earliest models established and known for its ability as a strong predictor of behavior. Sheppard, Hartwick, and Warshaw (1988) conducted a meta-analysis of the TRA model's ability to predict. The study analyzed included 87 studies of the intention-behavior relationship and 87 studies of the combination of attitude and social norm

on intention relationship. The results of their analysis provided strong overall evidence for the predictive utility of the TRA model. They discovered that the predictive power remained strong even when researcher overstepped the model's intended conditions and parameters.

Three of the most commonly used theoretical models grounded in psychology research to explain and predict behavior are the Technology Acceptance Model (TAM) originally proposed by Davis (1986), the Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen (1975, 1980), and the Theory of Planned Behavior (TPB) proposed by Ajzen (1991). All three models have proven to be successful in predicting and explaining behavior across numerous research studies (Agarwal, Sambamurthy, & Stair, 2000; Gefen & Straub, 2000; Gong, Xu, & Yu, 2004; Lee et al., 2003; Rawstorne, Jayasuriya, & Caputi, 2000). In the following section each of the three models will be described.

#### *Theory of Reasoned Action (TRA)*

Developed by Fishbein and Ajzen (1975), the TRA was one of the earliest acceptance models whose theoretical principles are based in the field of psychology. The diagram in Figure 2 illustrates the sequential flow of causal links from beliefs, attitude, intention, to actual behavior (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975; Morris & Dillon, 1997). This is a general model that was “designed to explain virtually any human behavior” (Ajzen & Fishbein, 1980, p. 4) and helps predict human behavior when making adoption decisions.

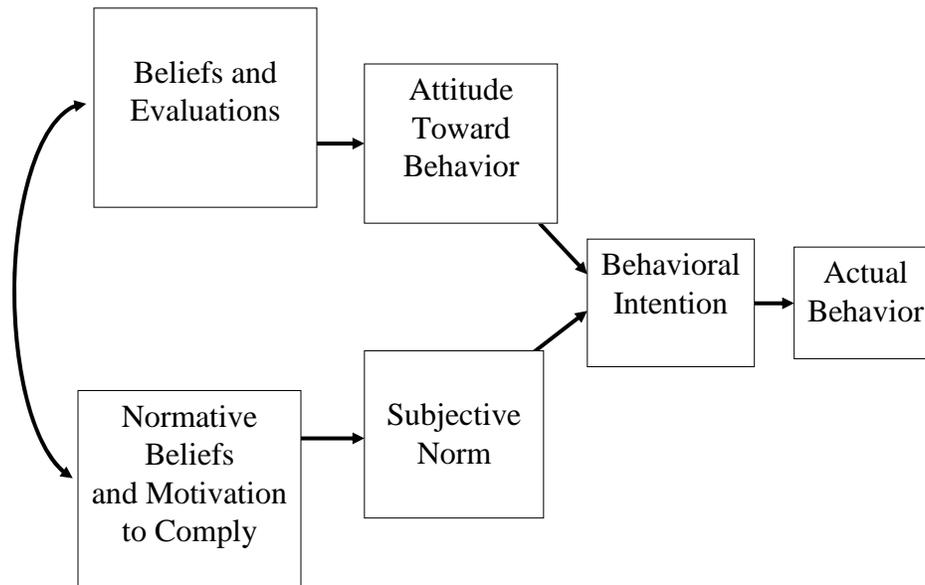


Figure 2. Theory of Reasoned Action (TRA) Model.

The TRA model has been widely researched and substantial empirical evidence has demonstrated its ability in predicting and explaining behavioral intention in a variety of domains (Ajzen and Fishbein, 1980; Davis, Bagozzi, & Warshaw, 1989; Fishbein & Ajzen, 1975; Sheppard, Hartwick, & Warshaw, 1988; Taylor & Todd, 1995a). According to TRA, two determinants—a person’s attitude and subjective norm toward a particular behavior—jointly determine a person’s behavioral intention. Behavioral intention is defined as a person’s intention to perform a specified behavior and directly predicts a person’s actual behavior. Subjective norm is a person’s perception of what other people think about the specific behavior and whether they should perform the behavior. Attitude is defined as a person’s positive or negative feelings about performing a specific behavior (Fishbein & Ajzen, 1975). The TRA model distinguishes between two types of attitudes constructs—attitude toward the specific object being evaluated and attitude

toward the behavior specifically involving the object being evaluated. According to Ajzen and Fishbein (1977), attitude toward an object has shown to be more strongly related to a specified behavior than the attitude toward using the object (Davis, 1989).

The TRA model postulates that any other factors besides attitude and subjective norm influence behavior indirectly by influencing attitude and subjective norm. Fishbein and Ajzen (1975) consider system characteristics, user characteristics, and organizational structure as external variables that only impact behavior indirectly through attitude and social norm (Davis, Bagozzi, & Warshaw, 1989). This model provides researchers with “a common frame of reference within which to integrate various disparate lines of inquiry” (Davis, Bagozzi, & Warshaw, 1989, p. 984). One of the disadvantages in using the TRA is that the salient beliefs are extracted specifically for a unique context and the resulting beliefs are regarded as distinctive to that particular context, and therefore cannot be generalized to other systems and users (Ajzen & Fishbein 1980; Davis, Bagozzi, & Warshaw, 1989). When compared to TAM, the TRA is at a disadvantage because it does not separate beliefs, but sums the beliefs and then multiplies them by corresponding evaluation weights into a single construct. Whereas TAM separates its usefulness and ease of use into two distinct constructs. This allows researchers to more easily identify relative influences of each belief in determining behavior and to create research studies that can control for external variables and then measure those variable influences on particular beliefs (Davis, Bagozzi, & Warshaw, 1989). In addition, Fishbein and Ajzen (1975) indicated the TRA is too restrictive because the only behaviors that are under total volitional control can apply within the theory. In circumstances where a person does not have complete control over their behavior, Ajzen introduced the Theory of Planned Behavior (TPB) as an extension of the TRA (Ajzen, 1991).

### *Theory of Planned Behavior (TPB)*

The TPB presumes that attitudes, subjective norms, and “perceived behavioral control, together with behavioral intention, can be used directly to predict behavioral achievement” (Ajzen, 1991, p. 184). The design of the TPB model allows it to be applied to information system use across various contexts to predict individual adoption behavior (Leone, Perugini, & Ercolani, 1999; Mathieson, 1991). The TPB has been successful at predicting and explaining a person’s behavioral intention within many variations of information technologies (Ajzen, 1991, 2002; Taylor & Todd, 1995a, Wu & Wang, 2005). The TPB model depicted in Figure 3 illustrates that behavioral beliefs influence either a positive or negative attitude toward the behavior; normative beliefs influence perceived social pressure or subjective norm; and control beliefs have an effect on perceived behavioral control. Together attitude toward the behavior, subjective norm, and perception of behavioral control will predict a person’s behavioral intention.

In the TPB, attitude is defined as the person’s favorable or unfavorable feelings about the behavior in question. Attitude directly influences the strength of behavioral beliefs about the consequences of the behavior and attitude is equated with attitudinal belief connecting the behavior to a specific outcome weighted by an evaluation of the agreeability of that outcome. (Ajzen, 1991; Ajzen & Fishbein, 2005; Wu & Wang, 2005).

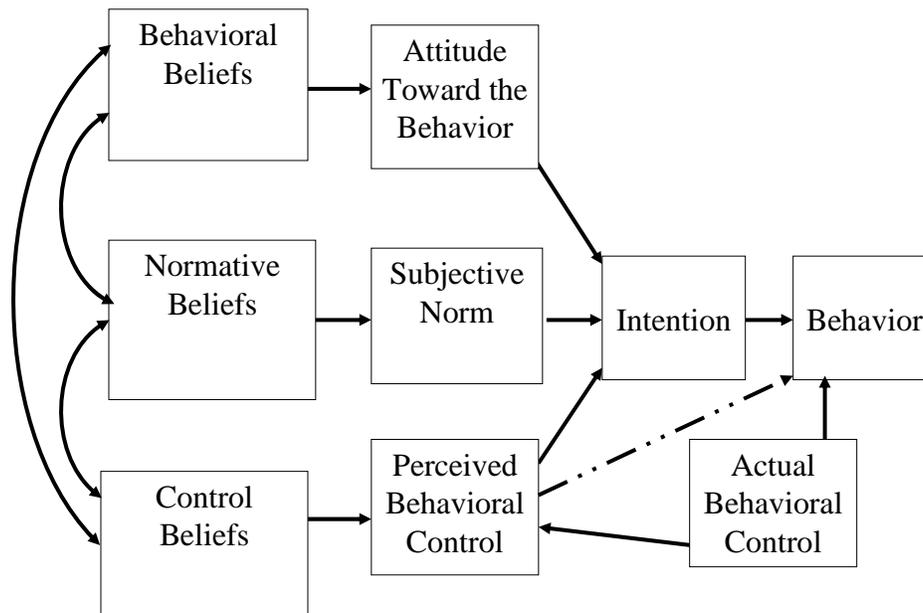


Figure 3. Theory of Planned Behavior (TPB) Model.

Subjective norm is defined as a person's perception of organizational or social pressures of other people to perform the behavior (Ajzen, 1991). The perceived behavior control factor was included to explain the situations where persons do not have complete control over their behavior--a shortcoming of the previous TRA model. It is not clear how subjective norm is a determinant of IT usage. Neither Davis et al. (1989) nor Mathieson (1991) were able to observe a significant relationship between subject norm and behavioral intent. Taylor and Todd (1995a) speculate that the lack of significant findings may be due to the lack of external pressure to perform the behavior and no real consequences for not performing the behavior.

Perceived behavioral control refers to “people’s perception of the ease or difficulty of performing the behavior of interest” (Ajzen, 1991, p. 183) and is linked to the concept of perceived self-efficacy (Bandura, 1977, 1982). In essence, the more favorable the attitude and

subjective norm, and the greater the perceived control, then greater is the person's intention to perform the behavior in question.

### Technology Acceptance Model (TAM)

TAM was first introduced by Davis (1986) as an extension of TRA and is shown in Figure 4. It is one of the most parsimonious and powerful theoretical models used to determine an individual's acceptance and behavioral intent to use a technologically-based system mediated through two major variables: perceived usefulness (PU) and perceived ease of use (PEOU) (Lee et al., 2003; Lucas & Spitler, 1999; Venkatesh & Davis, 2000).

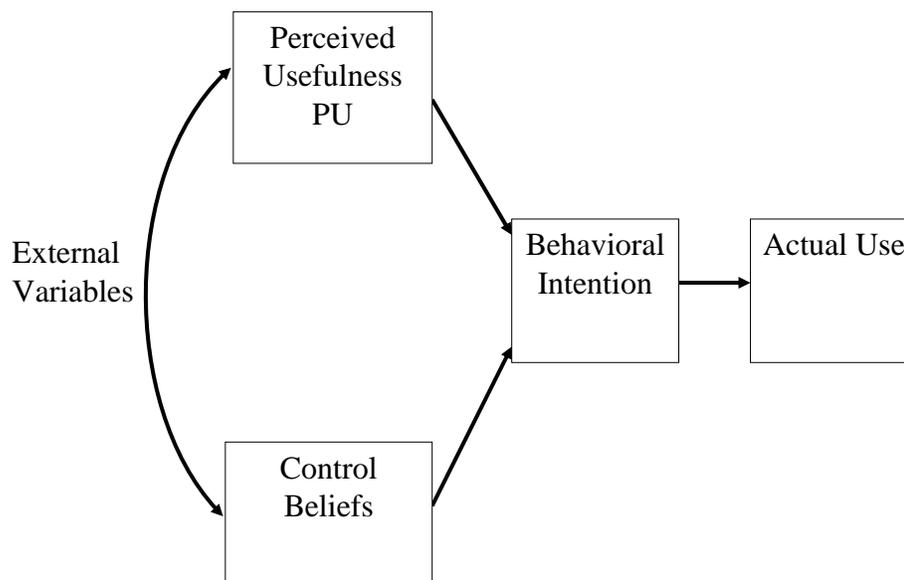


Figure 4. Technology Acceptance Model (TAM).

This view is also consistent with Rogers (1983) who posited that adoption of innovation is a function of multiple factors, which included relative advantage and ease of use of the

innovation. TAM was specifically developed to explain computer usage behavior (Davis et al., 1989) and therefore, was chosen to be the model applied in this study to measure participant's intention towards the use of oTPD. According to the original TAM (Davis, 1989; Davis et al., 1989) user perceptions of usefulness and ease of use are mediated through the user attitude construct to influence behavior intention. Perceived usefulness (PU) is defined as the degree to which a user believes that using a system will enhance their productivity or performance. Perceived ease of use (PEU) is defined as to the degree to which a user believes that using a system will require minimal effort (Davis, 1989; Morris & Dillon, 1997). A wide variety of research studies have shown that intention to use a technology is the strongest predictor of actual usage behavior (Davis & Venkatesh, 2004, Venkatesh & Davis, 2000). As the model was furthered developed, attitude towards using the technology was removed based on empirical evidence that the attitude construct did not fully mediate the effects of perceived usefulness or intention (Davis et al., 1989; Davis & Venkatesh, 2004). It was postulated that the intention to use a technology is more directly influenced by the individual's perception of its usefulness even if they did not have a positive attitude toward using the technology. Research has demonstrated that the model's parsimony is strengthened and the explanatory power is maintained when excluding the attitude construct (Venkatesh & Davis, 1996; Venkatesh & Davis, 2000).

Past studies have compared the TAM to the previous two models mentioned in this review of the literature which have demonstrated the TAM to be equal or superior to the other models in numerous cases. Hubona and Cheney (1994) compared TAM and TPB and discovered that the TAM offered a slight empirical advantage and was simpler, easier to use, and more powerful at explaining users' technology acceptance. In contrast, Taylor and Todd (1995b) compared TAM with the TPB model and a slightly modified TPB model called a Decomposed

TPB and found that the TPB models gave a fuller explanation than TAM, and that it was much simpler and easier to use. Chau and Hu (2002) compared TAM to TPB and determined TAM to be a more appropriate model for explaining an individual's technology acceptance decisions. Davis et al. (1989) found that TAM explained the acceptance intention better than TRA in measuring of MBA students' adoption with a word processor. TAM has also been recognized as an efficient and cost effective tool for predicting end user acceptance (Morris & Dillon, 1997). Morris and Dillon (1997) found the TAM to be "extremely robust and has been replicated using different tasks and tools" (p. 61).

However, there are some limitations or disadvantages to the TAM that should not be ignored. Although the TAM has demonstrated its ability to be predictive, its generality does not provide the explicit details needed by systems designers to develop new systems that create better user acceptance (Mathieson, 1991). Venkatesh and Davis (1996) state the following:

While being very powerful in helping us predict acceptance, one of the limitations of TAM is that it does not help understand and explain acceptance in ways that guide development beyond suggesting that system characteristics impact ease of use and usefulness perceptions. This places a damper on our ability to meaningfully design training interventions to foster acceptance. In order to be able to explain user acceptance and use, it is important to understand the antecedents of the key TAM constructs, perceived ease of use and usefulness. (p. 472)

It follows that TAM—by focusing on a small number of fundamental variables—can effectively provide a basic framework to determine the impact of other external factors on internal beliefs, and intentions (Davis et al., 1989). The TAM has been extended to suit various research

objectives by adding user characteristic variables, task characteristics, and organizational factors (Lee et al., 2003).

Past research predominantly examined the determinants of users on specific computer applications. However, more recently and increasingly TAM has been successfully modified and applied to internet-based technologies and applications to study user acceptance and usage behavior. This includes online shopping websites (Chen , Gillenson , & Sherrell, 2002; Koufaris & LaBarbera, 2002; Gefen et al., 2000; Gefen & Straub, 2000), the use of services and resources on the WWW (Agarwal & Prasad, 1998; Gao, 2005; Parthasarathy & Bhattacharjee, 1998; van der Heijden, 2003), web-based training and university courses (Brown, 2002; Carswell & Venkatesh, 2002; Cheung & Huang, 2005; Drennen, Kennedy, & Pisarski, 2005; Gong, Xu, & Yu, 2004, 2004; Landry, Griffeth, & Hartman, 2006; Lee, Cho, Gay, Davidson, & Ingraffea, 2003; Moon & Kim, 2001; Ong, Lai, & Wang, 2004; Pan, 2003; Pan, Sivo, & Brophy, 2003; Pan, Sivo, Gunter, & Cornell, 2005; Sivo, Pan, & Brody, 2004), and telecommunication systems such as telemedicine (Chau & Hu, 2001, 2002; Hu, Chau, Sheng, & Tam, 1999; Venkatesh, 1999). One recent study modified the TAM to explain online gaming use (Hsu & Lu, 2004). Of all these studies, none included classroom teachers' acceptance and usage of online learning for professional development.

One of the areas of discussion among researchers of technology acceptance is the different impact in voluntary use or mandatory use environments (Brown, Massey, Montoya-Weiss, & Burkman, 2002). Mandated use environments are when the use of a technology is a compulsory requirement of an organization in order to do a job (DeLone & McLean, 1992). Voluntary use environments are when the use is a willful choice made by the intended user (Agarwal & Prasad, 1997; Brown, et al., 2002; Venkatesh & Davis, 2000). In the context of this

study, enrolling in oTPD is voluntary; however, the actual use of the technology is mandatory in order to have access to the professional development course. Brown, Massey, Montoya-Weiss, and Burkman (2002), conducted a study to examine the relationships of technology acceptance of a particular banking software system in a mandatory use situation. The results of their study indicated that the employees would continue using the system regardless of their perceptions of the ease of use or usefulness of the system in order to continue working for that particular organization requiring the use of the system. It is expected in the context of this study that the actual usage of the online course would not be influenced by the users' perceptions of the system, since it is mandatory to access the course. However, continuance intention would be impacted by these perceptions, as teachers are able to voluntarily choose to use oTPD in the future. Based on past research it can also be expected that the usefulness of the oTPD to improve their performance in the classroom would have a greater influence on their behavior intentions to continue using the technology than the perceived ease of use (Davis & Venkatesh, 2004; Venkatesh, 2000).

### Continuance Intention

The TAM infers that perceived usefulness and ease of use are the major determinants of the behavior intention to use a technology, but did not consider continued use after the initial adoption phase. User technology acceptance or adoption of a system is the initial step to realizing the success of oTPD. However, the ultimate success of oTPD is determined by the willingness of teachers to continue to use this method of delivery for professional development during the lifetime of their teaching profession. Continuous intention is another way of measuring

technology acceptance. The TAM model traditionally includes the usage variable rather than continuance intention. In this study the common usage variable would not be appropriate since the use of the technology is mandatory in order to access the professional development course (Brown, et al., 2002; DeLone & McLean, 1992).

Several studies in the field of information systems have examined user's continuance intention by employing various information systems usage models such as the expectation confirmation model (ECM) (Bhattacharjee, 2001a), and the Expectancy Disconfirmation Theory (EDT) (Chiu, Hsu, Sun, Lin, & Sun, 2005) which are two models based on Oliver's (1980) expectation-confirmation theory (ECT) (Hayashi, Chen, Ryan, & Wu, 2004). ECT is used in consumer behavior literature to examine consumer satisfaction, repurchase behavior, and service support (Oliver 1980, 1993; Patterson, Johnson, & Spreng, 1997).

Only a few studies have employed the use of technology acceptance models to examine continuance intention (Hsu & Chiu, 2004; Kim & Malhotra, 2005; Koppius, Speelman, Stulp, Verhoef, & van Heck, 2005; Roca, Chiu & Martinez, 2006). Hsu and Chiu (2004) used the theory of planned behavior (TPB) to predict electronic tax filing service continuance. This study implied that the TPB model could be used to examine continuance intention through mediating variables. Roca et al. (2006) used the TAM extended with the EDT model to examine continuance intention of e-learning. Koppius et al. (2005) used a model that combined different factors of the expectation-confirmation theory (ECT) model and TAM to explain continuance intention among customers of a web-based airline ticket agency in the Netherlands. One surprising result of the study indicated that attitude toward the web-based system had little impact on usage. Kim and Malhotra (2005) collected data from users of a personalized portal Web site developed for a large university to determine continued information systems use that

employed a modified TAM. These researchers indicated that new models based on the TAM could be easily extended according to different conceptual frameworks to further investigate continuance intention.

### Online Social Presence Theory

The theory of social presence had its inception through the research of social psychologists Short, Williams, and Christie (1976), although other researchers would say that it could be traced back to Mehrabian's (1969) concept of immediacy (Rourke, Anderson, Garrison, & Archer, 2001). Mehrabian (1969) described immediacy as "communicative behaviors that enhance closeness to and nonverbal interaction with another" (p. 203). The concept of immediacy and social presence are closely related and are often used interchangeably in the literature (Thurlow, Lengel, & Tomic, 2004).

Short and his colleagues studied the affect of teacher behaviors within a traditional face-to-face classroom on students (Short et al., 1976). Teacher immediacy behaviors for instructional communication were examined and described by Kearney, Plax, and Wendt-Wasco (1985), Gorham (1988), and Christophel (1990). Both verbal and nonverbal behaviors contribute to the creation of immediacy and intimacy (Aragon, 2003). Aragon (2003) stated that Rourke and others researchers suggest that, "high levels of social presence create a learning environment that is perceived as warm, collegial, and approachable" (p. 60).

Social presence is defined as the "degree of salience of the other person in the mediated interaction and the consequent salience of the interpersonal relationships" (Short et al., 1976, p. 65). Research has indicated that social presence is a critical factor that supports the constructivist

learning process (Gunawardena, 1995; Gunawardena & Zittle, 1997; Tu & McIsaac, 2002). The constructivist theory is based on Vygotsky's (1978) concept that knowledge is a result of social interaction where an individual constructs meaning by communicating and sharing their understandings with others and not in isolation. Online learning environments can easily be designed to support and encourage learners to share their experiences and ideas with others to facilitate this type of social interaction that enable students to learn from each other (Salomon, 2000). Swan and Shih (2005) found that online students who identified their course as having a high level of social presence differed in reporting how they learned from those who perceived a low level of social presence in their course in that they attributed what they had learned to the interactions with their classmates. Tu and McIsaac (2002) identify three dimensions critical for generating a sense of community: social context, online communication and interactivity. Social context is in regard to the characteristics of the participants and their perceptions; online communication is in regard to how language is used and applied among the participants, and interactivity is in regard to the how participants engage in activities with one another and their communication styles.

In recent years the concept of social presence has become a focus of much attention and interest due to its impact on online learning (Rourke & Anderson, 2002). Online distance education research studies have indicated that social presence can influence post-secondary students' satisfaction and persistence within a web-based course (Arbaugh, 2001; Jung, Choi, Lim, & Leem, 2002; Richardson & Swan, 2003). Yet other evidence indicates that social presence has no significant impact on student satisfaction and persistence (Wise, 2004). More research needs to be conducted to get a better understanding of how social presence influences users (Picciano, 2002; Richardson & Swan, 2003). An area where social presence has not been

studied and is needed is in online teacher professional development. Anderson and Harris (1997) conducted one study of teachers using a statewide educational telecomputing network. The researchers of this study suggest that socially oriented factors were determinants to predict use and user gratification of the system and strategies should be used in the development of such programs that would increase the social interactions of the network users to “enhance perceptions of the systems’ social presence” (p. 19).

Studies have also concluded that teacher presence established through interaction or immediacy behaviors is an especially important issue to online education effectiveness (Garrison, Anderson, & Archer, 2001; Richardson & Swan, 2003; Shea et al., 2003; Wilson & Stacey, 2003). Online social presence suggests that interactions between people can impact the perception that the other person is physically present or “real” in a computer mediated environment. Arbaugh (2001) also found that immediacy behaviors were one of the factors that positively correlated to student learning. Research findings have demonstrated that the student ratings of online course quality are directly influenced by the instructor’s ability to provide timely and consistent feedback to students enrolled in the course (Muirhead & Betz, 2002; Swan & Shih, 2005). Online distance education research has indicated that social interactions can influence post-secondary student’s satisfaction and persistence within a web-based course (Arbaugh, 2001; Richardson & Swan, 2003). Literature on the theory of online teacher/instructor immediacy behaviors and its relevancy in the context of online teacher professional development is sparse. With the ever-increasing number of online professional development programs being implemented across the globe this has become a question of importance to the education professionals, administrators, teachers, and researchers. The conceptual framework of social presence is based on a combination of theories in the areas of transactional distance, online

interactions, and social context. Social context includes social presence, teaching presence, and cognitive presence that are intertwined with online interactions. Figure 5 depicts an adaptation of the Rourke, Garrison, Anderson, and Archer presence model (Swan, 2004).

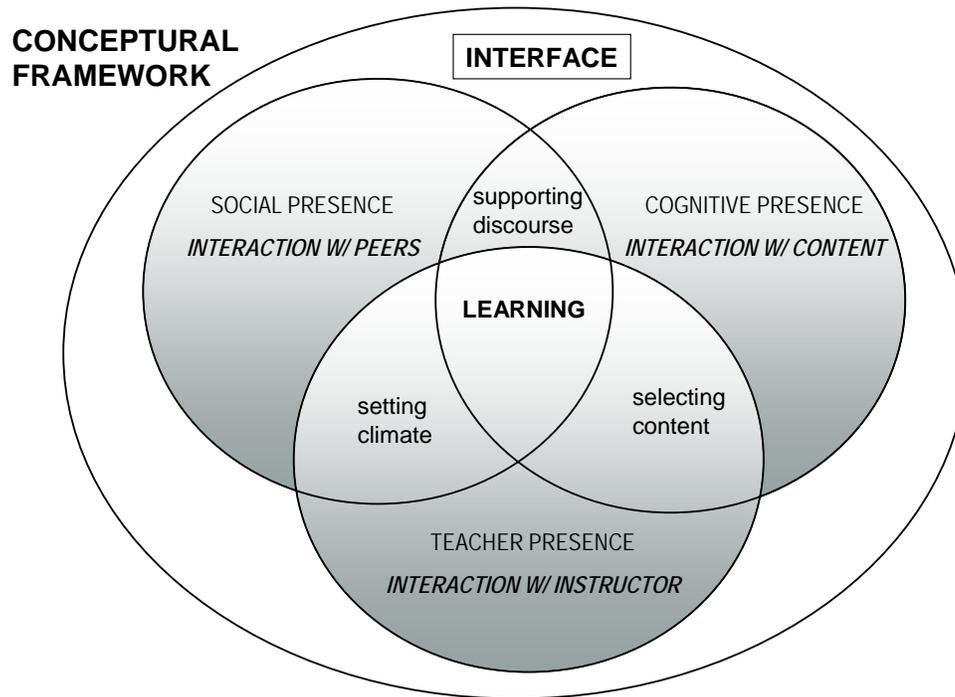


Figure 5. Community of Inquiry Model - Swan’s adaptation from Rourke et al. (2001).

Research in the area of social interactions, specifically the three major types within the context of web-based instruction, was introduced by Moore in 1989 and encompassed learner-content interactions, learner-instructor interactions and learner-learner interactions.

Moore (1989) developed a classification scheme for interaction identifying three types of interaction: learner-instructor; learner-content, learner-learner. Later another type of interaction—learner-interface—was added by Hillman, Hills, and Gunawardena (1994). The first interaction mentioned is the interaction between the instructor and a learner or learners. This

interaction can be conducted as direct instruction, one-on-one interaction, or feedback. The role of the instructor changes with online courses compared to traditional face-to-face, as the instructor plays the role of a mentor, providing guidance, encouragement, and information to the learner. Learner-learner interaction engages two or more learners in communication about experiences ideas, or viewpoints about the content of the course. Learner-content as defined by Moore (1989) is the learner “intellectually interacting with content” to change the perspective or improve understanding on the part of the learner (p. 2). The fourth learner-interface is based on the concept that the learner must interact with the mediated interface when performing a computer-mediated task. Learner-interface interaction involves how the learner uses the computer interface to access and participate in the course instruction and how the computer interface facilitates the communication with instructors and other learners (Lohr, 2000).

Swan (2002) conducted an intensive study with 3,800 students taking over 260 courses and found that students that perceived greater interactions with the instructor also perceived that they learned more and were more satisfied with the courses. Gunawardena (1995) has conducted significant research demonstrating that social presence has an affect on student satisfaction and performance. Similar research in post-secondary education courses has supported these findings (Aragon, 2003; Gunawardena, 1995; Gunawardena & Zittle, 1997; Richardson & Swan, 2003; Tu, 2002a; Tu & McIsaac, 2002). Social presence is necessary to build online community among participants; “it is inconceivable to think that one could create a community without some degree of social presence” (Garrison & Anderson, 2003, p. 49).

Heinich et al. (2002) advocated that as the learner interacted with the information and learning environment they constructed new knowledge, skills and attitudes. Online learner interaction is essential for creating the sense of social presence (Murphy & Cifuentes, 2001).

Interaction, immediacy, and social presence are all terms used in researching communication and feedback between the online instructor or facilitator and the learner. Adults largely learn from social interaction with the instructor and other students. Learning is a social endeavor for most adult learners. With the advent of online communications has come the enhancement of social interaction and communication to distance education not as immediate as with correspondence courses. Muirhead (2001) defines online interaction as the "interactivity" by the learner in communication with other learners or the instructor. Kearsley (2000) stated the "the most important role of the instructor in online classes is to ensure a high degree of interactivity and participation" (p. 78). Parker (1999) also emphasized that the instructor must be the one to facilitate the learner interactions within the context of an online course.

How the availability of this personal, immediate, and responsive interaction affects the online learner is of great interest to many researchers. Understanding how the social engagement of the facilitator and the learner can be strategically infused into online instructional design would be significant to the further enhancement and implementation of this alternative delivery mode.

### Sociability

The study by Kreijns, Kirschner, Jochems, & Van Buuren (2004a, 2004b) within a computer supported collaborative learning (CSCL) context demonstrated that social presence and sociability are two separate constructs. Kreijns et al. (2004a) define sociability "to be the extent the CSCL environment is able to give rise to . . . a social space. Or more precisely, the extent to which a CSCL environment is able to facilitate the emergence of a social space" (p. 157). Social

presence differs from sociability in that sociability is the degree to which a system supports the interaction of the participants. Sociability itself does not create social presence, but the emergence of social presence is dependent upon the system's ability to facilitate the interaction and knowledge sharing between users. Kreijns, et al. (2004a) viewed sociability and social presence as part of the properties necessary to build a sound social space, and "sound social space is important since it facilitates and reinforces social interaction and, in turn, influences the effectiveness of collaborative learning" (p. 169). They argued that Gunawardena's definition of social presence as "the degree to which a person is perceived as a 'real person' (p. 151) is not the same as the sociability defined as the ability of a system to facilitate social interaction among technology users. Preece's (2000) view of sociability slightly differs in that Preece separates usability from sociability. Even though the two are closely related, usability focuses on the interaction across the human-computer interface while sociality is human-human interactions supported by technology (Preece, 2000). In either case, social presence is dependent on a system's ability to create social space. Therefore, sociability is being examined as a separate construct in this study and its influence on the TAM as it relates to oTPD.

### Summary

The first section of this chapter provided the background of online education and teacher professional development and how research studies have progressed and the phenomenal growth of oTPD to meet the needs of teachers and schools. The second section presented an overview and comparisons of the three technology acceptance models and how each model contributed to understanding how users' perceptions influence the adoption of new systems. The third section

described social presence theory and the conceptual components that are integrated into this theory. Studies in social presence were identified that helped to built the understanding of how social dynamics impact student performance and satisfaction. In the final section a description of the online course taken by the participants of the study to reviewed.

Research in social presence will continue to provide information to show how and why social presence plays such a significant role in formulating online community. It is important that researchers continue to discover approaches and strategies that contribute to the social and intellectual interaction among online participants that will benefit student satisfaction and performance in computer mediated environments. The focus of this study is on the perceptions of teachers towards the ease of use and usefulness of oTPD and behavior intention to continue to use this technology. The results will assist educational leaders and policy-makers in implementing programs that draw upon limited financial resources. In addition, this research is aimed at creating new knowledge that will help curriculum developers of online teacher professional development enhance the overall instructional design quality and usability of such systems intended to fill the gaps in teacher knowledge or abilities and expand professional development. Online teacher professional development expands the opportunities and availability for teachers to improve their knowledge and skills that will ultimately result in improved teacher quality and hence increased student learning in the classroom (Darling-Hammond, 1998, 2000).

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **Introduction**

This chapter describes the purpose of the study, participant selection, data instrumentation, type of research design used, description of the context of the study, data collection and analysis procedures. The chapter delineates the development of the proposed procedures and implementation of the study as they relate to the research questions and the specific variables under investigation. The intent of this section is to provide the reader with ample detail to judge the capacity of the methodology to produce accurate results.

### **Statement of Purpose**

The purpose of this study was to determine if the Technology Acceptance Model (TAM) can explain the relationship between a teacher's acceptance of an online teacher professional development course and their continuance intention. In this study the TAM was extended with two more constructs: sociability and social presence. The TAM was also extended to include an additional dependent variable: knowledge gains. Using this expanded version of the TAM, the study examined the causal relationships between sociability, social presence, perceived usefulness, perceived ease of use, continuance intention, and gains. The study focused on answering the following questions:

## Research Questions

1. Does the overall hypothesized Technology Acceptance Model (TAM) fit the data in predicting teachers' continuance intention to use online Teacher Professional Development (oTPD)?
2. To what extent does sociability and social presence impact the TAM?
3. To what extent does social presence impact knowledge gains in an oTPD based program?

## Study Participants and Sample Selection

The study used a purposive sampling targeting teachers enrolled in a statewide online reading professional development course during the Spring 2006 (Shadish, Cook, & Campbell, 2002). Such a sampling strategy while not amendable to internal validity has the advantage of better disposed in terms of external validity (Sivo, Saunders, Chang, & Jiang, 2006). The choice of the targeted group was made primarily because of their status as classroom teachers and their present and possible future use of online professional development. Due to ethical considerations, teachers were self-selected by choosing freely to enroll in the web-based course and to participate in this study. The course was initiated and developed by two faculty members from a large southeastern state university with approximately 45,000 students. One faculty member was an expert in the field of reading and research-based reading instructional strategies; the other faculty member was an expert in the field of educational technology and instructional design. Participants were located at various locations across the state of Florida. The course was offered free of charge to all k-12 public school teachers within the state to support teachers in

obtaining the state reading endorsement. Graduate students interested in the course could also enroll through the host university.

Three separate course groupings were active during the Spring 2006 semester—open enrollment, district enrollment, and other (included graduate students and preservice community college students). During Spring 2006 there were three options for participants: a 12-week course, a 10-week course, and for graduate school sections a 14-week course. Those in the 10-week course completed two lessons on selected weeks to fulfill the requirements of the course. The completion rate for this term was 77 percent. The content of the online course was the same for all participants; however, the online facilitators and the numbers of participants within each course section varied. Average enrollment size for individual sections was 20-25 students. There were 123 sections having one course facilitator assigned to work with course participants. A total of 117 facilitators were employed during that semester. Email addresses were provided for 2,130 individuals who had intended to enroll in the course to invite them to voluntarily participate in this study. Of those, 1,905 participants actually enrolled in the online course, and 1,493 completed the course, and a total of 752 responded to the questionnaire for a response rate of 50 percent. Due to missing data items of those collected, 517 valid responses were identified and used in the data analysis. The ages ranged from 20-56+ years of age and were predominantly female, having 434 females (83.9%) and 83 males (16.1%). The fully web-based course was open to all Florida certified K-12 schoolteachers and other educators interested in learning about instructional reading strategies. Although some non-teaching students took the course, the majority of participants (N=459) indicated they were classroom teachers (88.8%). Most participants (N=451) indicated that they took the course to meet the Florida Department of Education's Reading Endorsement requirements (87.2%).

The online course was offered using a WebCT system. WebCT features and tools used by the course included: content modules, email, calendar, forum discussion, quizzes, and grades. The syllabus and all materials needed for the course were posted on the course website. Quizzes were taken at the end of each module online and score results were provided immediately after completion of the quiz. Modules integrated Internet resource links for those teachers interested in delving deeper into the content. Streamline video of a reading university professor was included at the beginning of each module to summarize the purpose of the module and what would be learned in the module. Learning objects such as word puzzles, short quizzes, and other simple word games were also utilized in the modules.

#### Data Collection Instrumentation

Dillman's (2000) Tailored Design Method was the basis for procedures and techniques used in collecting data from an online self-administered questionnaire. Several questionnaire items were considered to measure the TAM and the expanded constructs of sociability, social presence, and satisfaction. The questionnaire was administered online to the participants in the course and used to measure six constructs. The questionnaire was comprised of 41 five-point Likert scale multiple-choice items. A list of the items on the questionnaire is provided in Appendix D. The instrument included measures for: 1) perceived ease of use (5 items); 2) perceived usefulness (5 items); 3) sociability (9 items); 4) social presence (9 items); 5) continuance intention (3 items); and 6) participant demographics (8 items). Scores on perceived ease of use and perceived usefulness scales could range from five to 25 points; sociability and social presence, from nine to 45 points; and continuance intention from five to 15 points. Each of

the constructs in the questionnaire and data gathered from pre and post test scores are described in the following section. The questionnaire was distributed in the Spring 2006 semester during the last two to three weeks of the course. Students had three weeks to respond.

### Ease of Use and Usefulness Items

The TAM consists of a set of questions to measure the perceived usefulness and perceived ease of use variables. The questionnaire developed for this research study was based upon the questionnaire used by Davis (1989) with necessary wording tailored to measure perceived ease of use and usefulness of the online teacher professional development course. In the original Davis (1989) instrument, a seven point Likert scale was used to measure perceived usefulness; however, to reduce variability and increase precision a five point Likert scale was used in this study. Lissitz and Green (1975) suggest that reliability levels off after five points; therefore, five point Likert type scales are one of the most reliable scales and therefore were used for this study. Participants were asked to respond based on their perceptions of the online course on five items for each of the two constructs for a total of 10 variables. The items were measure on a five-point Likert scale with 1 as “Strongly Disagree,” 2 as “Somewhat Disagree,” 3 as “Neither Agree or Disagree,” 4 as “Somewhat Agree,” and 5 as “Strongly Agree.”

The items used for perceived ease of use and perceived usefulness have repeatedly established their reliability and validity in previous studies (Adams, Nelson, & Todd, 1992; Davis, 1989; Davis, et al., 1989; Mathieson, 1991; Taylor & Todd, 1995a; Venkatesh & Davis, 1996). Adams et al. (1992) replicated the study conducted by Davis (1989) using two different settings and samples and found the satisfactory levels of validity and reliability of the instrument

used by Davis to measure perceived usefulness and perceived ease of use. Moon and Kim's (2001) study on the acceptance of the world wide web (www) resulted in scores with a Cronbach's alpha above .93 for both constructs. Gao (2005) documented measures for perceived ease of use and perceived usefulness having score reliability of greater or equal to .85 and .90 respectively.

The respondents were asked to indicate their perceptions related to the specific online course as described by the statements for item. The perceived ease of use measured the degree to which the respondent believed that using online professional development would be free from effort. Statements such as "I find online professional development courses easy to use," and "It is easy to become skillful at using the online course" were part of the questionnaire. Perceived usefulness measured the degree to which the respondent believed that using online professional development would enhance their performance as teachers. Two samples of items included in the instrument were "Using online professional development would enhance my performance in the classroom," and "Using online professional development would make it easier for me to access teacher professional development learning opportunities."

### Social Presence and Sociability and Items

Several instruments have been developed to measure social presence and student satisfaction. The GlobalEd Questionnaire is based on a social presence scale developed by Gunawardena and Zittle (1997) and is used to examine social presence as a predictor of student satisfaction within a computer-mediated conferencing context. Another instrument is the Social Presence and Privacy Questionnaire (SPPQ) developed by Tu (2002b) to measure social

presence and privacy perceptions of students. Tu (2002b) adds the perceived privacy attitude, which is not included in Gunawardena and Zittle's (1997) instrument. However, neither instrument distinguishes between the sociability of a system and social presence. Kreijns' et al. (2004a) study demonstrated that social presence and sociability are two separate constructs. Social presence is dependent on a system's ability to create social space. Therefore, an instrument was adapted using components of both the GlobalEd and the Kreijns instrument. This section of the questionnaire consists of 18 Likert-type items to gather data on student perceptions of social presence and sociability. This instrument was of special interest due to its focus on social presence within an educational setting. Participants were asked to respond based on their perceptions of the specific online course on eight items for each of the two constructs for a total of 18 variables.

The study conducted by Kreijns et al. (2004a, 2004b) resulted in a Cronbach's alpha that revealed a high internal consistency for Social Presence Scale scores, which was 0.81. The nine items for the social presence construct were measured on a five-point Likert scale with 1 as "Strongly Disagree," 2 as "Somewhat Disagree," 3 as "Neither Agree or Disagree," 4 as "Somewhat Agree," and 5 as "Strongly Agree." Instrument items used included statements such as "When I have email correspondence in this online professional development environment, I have my communication partner in my mind's eye," "I felt that my point of view was acknowledged by other participants in the online course," "When I have email correspondence in this online professional development environment, I also feel that I deal with very real persons and not with abstract anonymous persons," and "The facilitators created a feeling of online community."

Kreijns, Kirschner, Jochems, & Van Buuren (2004a) Cronbach's alpha also revealed a high internal consistency for scores on the Sociability Scale at 0.92. The nine items for the sociability construct were measured on a five-point Likert scale with 1 as "Not Applicable at All," 2 as "Rarely Applicable," 3 as "Moderately Applicable," 4 as "Largely Applicable," and 5 as "Totally Applicable." Instrument items used included statements such as "This online professional development environment allows spontaneous informal conversations," "This online professional development environment enables me to develop good work relationships with my classmates," and "This online professional development environment enables me to identify myself with the class."

#### Continuance Intention

Usage was not one of the variables used in this TAM being substituted with continuance intention. Continuance Intention can give insight into the post adoption phase and the three items included on the questionnaire were adapted based upon the prior research by Mathieson (1991) and Bhattacharjee (2001b). Bhattacharjee's (2001b) study on differences between acceptance and continuance behaviors resulted in Cronbach's alpha of .90 for the continuance intention construct scores. Hsu and Chiu (2004) reported a Cronbach's alpha of .91 for score comprised of similar items as those used on the instrument for this study. The items were measured on a five-point Likert scale with 1 as "Strongly Disagree," 2 as "Somewhat Disagree," 3 as "Neither Agree or Disagree," 4 as "Somewhat Agree," and 5 as "Strongly Agree." The three items were "I would choose to use online professional development on a regular basis in the future," " I would

choose to frequently use online teacher professional development in the future,” and “I would strongly recommend others to use online teacher professional development.”

### Participant Gains

Participants were required to take a pre and post test to measure gains in their reading instruction knowledge. The pre-test was taken during the first week of the course and a post-test during the thirteenth week of the course. The pre- and post- tests are administered online. The test is called the Teachers’ Reading Knowledge Assessment (TREKA). The TREKA contains 46 multiple items and four restricted response items. The pre and post tests were piloted and literacy experts validated the content. An item analysis and factor analysis were conducted on the TREKA in September 2006 based on the Kuder-Richardson Formula 20 (KR-20) using the software Reliability Calculator for the calculations. The KR-20 method was appropriate as items on the test were scored dichotomously, and the KR-20 reliability coefficient represents the mean of all split-half coefficients for a full-length test (Siegle, n.d.; Thorndike, 2005). The result of the KR-20 reliability coefficient was 0.91, which suggest that the TREKA was well-designed in terms of reliability.

### Participant Demographic Items

General demographic information was requested in the questionnaire such as age, gender, online experience (number of previous courses), years teaching, ethnicity, occupational status, reasons for taking the course and hours spend accessing the course online. This part of the questionnaire consisted of eight items on student demographics and online experience.

## Research Design

This correlational research study used structural equation modeling (SEM) to empirically test the hypothesized model based on Davis' (1986) Technology Acceptance Model (TAM) and two other constructs: sociability and social presence on participants in an online teacher professional development (oTPD) course. SEM is a mixture of confirmatory factor analysis, path analysis and regression. Other terms used for SEM are causal models, latent variable models, models with unobserved variables, analysis of covariance structures, and structural modeling (Pedhazur, 1997). An important advantage of SEM is that it allows the researcher to look at the relationship of multiple dependent and independent variables simultaneously and it can estimate relationships that take into account measurement error (Gefen et al., 2000).

In educational research, SEM has been used to address many questions of interest to educators. For example, Drennen et al. (2005) used this technique to assess the validity of a theoretical model that test factors affecting student attitudes toward online learning. Marks, Sibley, and Arbaugh (2005) studied the predictors for effective online learning. Pan, Gunter, Sivo, & Cornell (2005) and Selim (2003) analyzed the factors in the Technology Acceptance Model (TAM) and its correlation to student attitudes toward aspects of online learning, while LaPointe and Gunawardena (2004) used SEM to test factors of peer interaction and learning outcomes in computer-mediated conferencing. In this study, causal pathways were explored and measured among participants' perceived ease of use, perceived usefulness, and the continuance intention of the online course. Sociability, and social presence constructs are also being examined to determine impact on the TAM variables. Knowledge gains in reading instructional strategies were included as a dependent variable.

## Course Description and Context

The course is entitled, “Competency 2: Foundations of Research-Based Practices” and addresses one of the five state competencies required for all Florida certified teachers as part of Florida’s reading endorsement certification. The course is offered through the Florida Online Reading Professional Development (FOR-PD) which is a large scale online professional development project designed to help teachers improve reading instruction for learners in grades preK-12. Experts in online instructional strategies designed the course to include the most effective strategies to enhance learning through interaction with the content, facilitator, and each other (Moore, 1989). The project is a collaborative effort among literacy experts and organizations and is aligned with the state’s formula for reading success.

The development and operations of the online course were initially funded in January of 2003, through the Florida Department of Education, Just Read! Florida program. As of October 2006, over 14,000 students have completed the course and 1,072 sections have been offered. Participating organizations included 67 school districts, seven universities, and six community colleges.

The course is offered using the Web-CT platform and entails 14 modules. A course outline and sample lesson are provided in Appendix A. Each lesson includes several instructional components listed below:

- Identification of Objectives
- Literacy Log/Reading Strategy
- Content
- External Links/Resources

- Elementary & Secondary Applications
- Differentiated Instruction
- Review Exercises
- Reading Reminders
- Task List
- Quiz
- Assignment: Discussion & Rubric

Participants are grouped into course sections of approximately 20 to 25 students. Facilitators are usually assigned one or two sections each. The online facilitators are district-based teachers that have expertise in K-12 reading instruction and are knowledgeable of the local and district literacy initiatives and policies, although a few facilitators are post-secondary faculty. To be qualified the facilitators must have at least three years' teaching experience, a master's degree in reading or other related area, and must be identified by the school or district as a reading literacy leader. The online facilitators may have little or no experience teaching online and may not have taken the online course first. Support for facilitators includes an extensive seven week training workshop for learning how to teach online, an online forum, newsletter, facilitator manual that includes sample emails, lists roles and responsibilities, and provides forms and other pertinent information. They are located across the state of Florida and are facilitating the start-up of new course sections at different times during the year.

One of the major roles of the online facilitators is to provide the personalized interaction and feedback for each participant enrolled in the course. Facilitators also offer ongoing recommendations to course developers on content, assignments, etc. to improve the effectiveness of the instruction. Facilitators contact and welcome those students enrolled by email within the

first week of the course. Within the opening contact the facilitators supply basic course introductory information, their contact information, and technical support contact information. In addition, facilitators share some background information about themselves and require each student to write and post a similar description on the web-based discussion forum to be shared with their fellow classmates. During this study online students were assigned a module each week and prepared weekly assignments that were then posted on the Web-CT course website.

Each week facilitators emailed students an overview of the content in the next scheduled module and the required assignment(s). In addition, students were required to post and read fellow classmates' comments on the course's discussion forum in regards to the content of the module being covered that week. Facilitators would email students individually to provide feedback on assignments submitted and to notify students if they were falling behind on completing course assignments. Students kept a weekly literacy log on what they had learned that focused on helping them integrate the new reading instructional strategies into their classrooms. The log was turned in at the end of the course for a course grade.

### Data Collection Procedures

The oTPD program provided a listing of 2,018 email addresses of individuals thought to be enrolled in the course after IRB approval (Appendix B). One week prior to distributing the questionnaire, an introductory email was sent from the researcher to the participants providing general information about the purpose of the study and contact information for questions or if they wanted to be removed from the contact list. One week later a letter was emailed providing general information and asking participants to complete the questionnaire after reviewing the

consent form. A website link was embedded in the email to direct participants to the online consent form. Prior to opening the questionnaire participants were required to read the consent form with regard the rights of human subjects (Appendix C). The consent form described the purpose of the study, stated that participation was voluntary and at their request they would be deleted from the contact list, provided assurances of the confidentiality and anonymity, and how the data would be used and reported. At the bottom of the consent form was the website link to the online questionnaire. Participants' email addresses were stored and kept confidential as the method to identify questionnaire respondents. Email addresses were needed to pair or match questionnaire responses with their pre- post- test scores. No detrimental effects were experienced in their relationship with the researcher, the online facilitator, or the university. The next week a reminder was sent to those who had not yet filled out the questionnaire. Each written correspondence to participants provided contact information for those who wanted to be removed from the contact list. During the third week and final week of the course the last email contact was sent requesting their participation in the study.

An online electronic survey support system called Form Manager was used to collect questionnaire data. The online questionnaire was posted on a website so participants had the opportunity to complete and submit the questionnaire at anytime online. Participants were given four weeks to respond to the questionnaire which was extended to eight weeks at the request of the participants. Results from the questionnaire were downloaded into EXCEL 2003. Pre and post test scores were paired with responses and included in the EXCEL spreadsheet and then transferred to SPSS version 12.0. SPSS was used to create a correlational matrix and for descriptive data. The correlational matrix generated in SPSS was utilized in LISREL student version 7.8 for analyzing the structural model and to examine causal path findings.

## Data Analysis

A path analysis design was used for this study to test the causal relationships between the observed variables in the hypothesized theoretical model. The continuous independent variables included participants' perceptions of the sociability and social presence within the online course, usefulness, and ease of use. These were measured using a five-point Likert scale. Dependent variables included participants' continuance intention and gains. Continuance intention items were measured using a five-point Likert scale. Student gains were based on the (TREKA) pre-test and post-test scores.

Correlations were calculated between six variables: participants' perception of sociability, social presence, usefulness, ease of use, instructional reading knowledge gains, and continuance intention.

## Summary

The researcher's goal was to identify significant factors that work through perceptions of the ease of use and the usefulness of oTPD to influence the future development and utilization of electronically delivery professional development. Knowing the antecedents of usefulness perceptions can provide administrators responsible for teacher professional development resources to present a case for expanding the use of such new technologies more effectively and convincingly.

It can be predicted that oTPD will continue to be critical for teachers' success in the 21<sup>st</sup> century based on past population growth in student diversity, the increasing need for teachers with higher levels of technical knowledge, and the need for educational organizations to support

and produce a more advanced technologically literate population. If trends continue, technological systems such as oTPD will be instrumental in increasing the quality of teachers and raising student achievement in classrooms across the nation.

## CHAPTER 4: RESULTS

### Introduction

The purpose of this study was to examine the causal relationships between the participants' perceptions toward their use of an online teacher professional development (oTPD) course and their future intention to continue using oTPD by applying an expanded version of the Technology Acceptance Model (TAM). The model was extended to include the influence of sociability and social presence on participants' perceptions of the oTPD course and continuance intentions. The study also was designed to examine the impact of social presence on participant's performance measured using gain scores on a pre-post test.

To test the theoretical model a path analysis was performed using the LISREL statistical software. The assumptions of normality and linearity were tested using SPSS statistical software using the maximum likelihood method of parameter estimates. The variance-covariance matrix was used for the analysis. Table 1 presents the descriptive statistics for the variables in this study, including the means, standard deviations and intercorrelations. The development of the initial measurement model indicated that a number of variables were not contributing to the overall model fit. Variables for attitude and satisfaction were initially considered as a part of the structured model developed; however, due to issues of multicollinearity of the variables, the fact that attitude is often not included in the TAM, and satisfaction is not part of the classic TAM model, they were not considered in the final hypothesized model. Cases with missing data were deleted from the data analysis of the 752 responses; 235 had missing data (N=517).

The results of the data analysis are presented in three sections. The first section presents the results of the overall fit of the model, which is followed by a discussion of the results according to the three primary research questions. The second section focuses on the characteristics of the data and the third section describes the demographics of the respondents.

Table 1. Means, Standard Deviations, Reliability Estimates (in parenthesis), and Factor Correlations

Variable	M	SD	PU	PEU	SPS	CI	SS	IRSK
PU	21.27	4.61	(.850)					
PEU	20.52	5.37	0.68**	(.847)				
SP	33.63	7.25	0.54**	0.55**	(.829)			
CI	12.11	3.44	0.65**	0.63**	0.67**	(.839)		
SS	28.97	8.91	0.33**	0.37**	0.68**	0.54**	(.871)	
IRSK	9.87	8.80	-0.01	0.00	0.03	-0.04	0.07	-

Note. SOC = Sociability; SP = Social Presence; PEU = Perceived Ease of Use; PU = Perceived Usefulness; CI = Continuance Intention. Coefficient alpha reliability estimates are reported in parentheses (N=517).

\*\* Correlation is significant at the 0.01 level (two-tailed).

A factor correlation was conducted on the scale level to avoid the potential colinearity encountered on the item level (Pan, Sivo, & Brophy, 2003). Factor correlation coefficients among variables are constructed using the Pearson correlation. Table 1 provides the factor correlation for the five constructions.

All variables on the scale are highly correlated at the 0.01 level ( $p < .01$ , two-tailed) except for the instructional reading strategies knowledge scores which do not significantly correlate.

### Path Analysis of the Proposed Model Fit

A path analysis was conducted using LISREL on data from 517 participants enrolled in an online teacher professional development course. A factor model of continuance intention was hypothesized with lines connecting variables hypothesized as direct effects (see Figure 6).

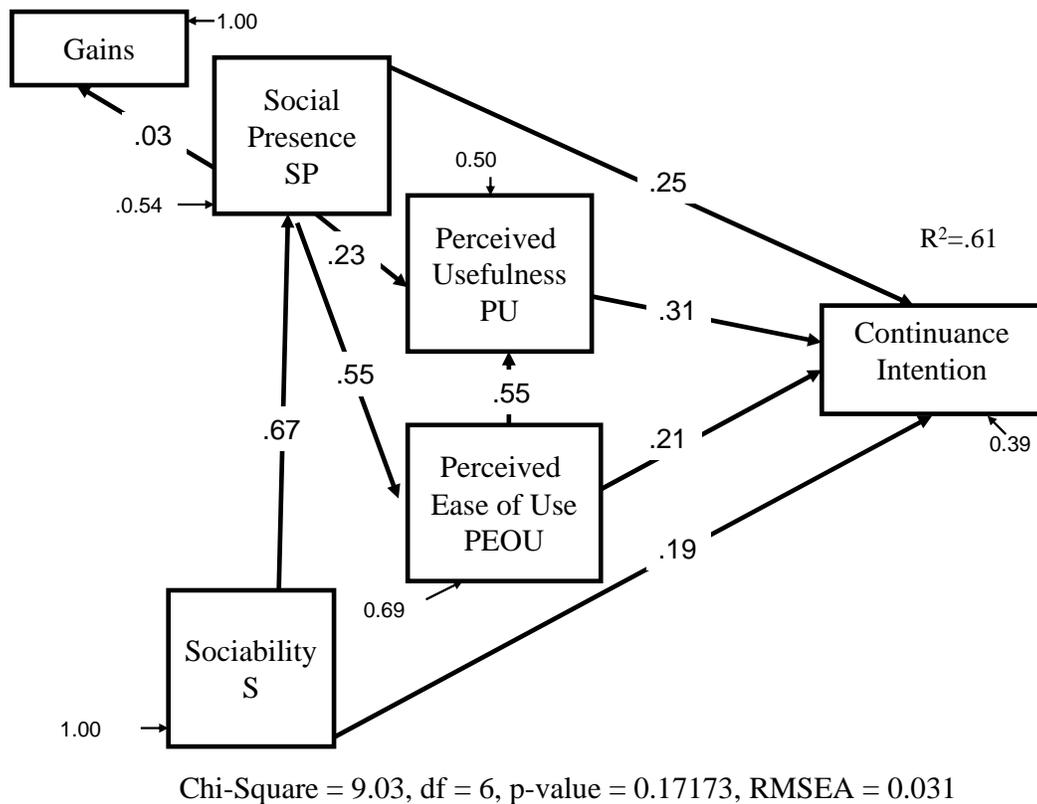


Figure 6. CFA model standardized results of hypothesized expanded TAM.

The measures to determine if the sample data fits the model are determined by examining the results of a series of fit indices. Since chi-square is singularly insufficient in its ability to provide reliable goodness of fit, other fit indices have been developed that help to determine more accurately how well the data fits the model. For the definitions and recommended cutoff measures for these fit indices see Definition of Terms section (p. 16).

The chi-square statistic result was not significant and the ratio of the chi-square to the degrees of freedom is less than two, indicating the model was a good fit ( $\chi^2 = 9.03$ ,  $df: 6$  ( $p=0.17173$ )). The stand-alone indices, including the Goodness of Fit Index (GFI) and the Normed Fit Index (NFI), equaled .99. The Adjusted Goodness of Fit (AGFI) was 0.98. Conventionally, researchers recommend a measurement result greater than .90; therefore these fit indices suggest that the model fits extremely well and does a good job of explaining the covariation in the data. The results of the incremental fit indices were all greater than .95, (CFI= 1.00, NNFI = 1.00, NFI = .99) which is indicative of a well-fitting model (Hu & Bentler, 1999). The root mean square error of approximation (RMSEA) is used to estimate the lack of fit in a model compared to a perfect model. Values of .06 or less are desired and results of this model indicate an excellent fitting model with a RMSEA of 0.031. The average differences between the sample variances and covariances and the estimated population variance and covariance are represented in the standardized root mean square residual (SRMR). The SRMR having a value of .08 or less suggests a well-fitting model. The SRMR result for this data set was .020; again demonstrating the model is indicative of a good fit. The goodness of fit indices for the proposed model are presented in Table 2.

Table 2. Goodness of Fit Indices for Various Models

Model	Chi-Square	df	p	NFI	NNFI	CFI	AGFI	RMSEA
Initial Model	9.03	6	0.17173	.99	1.00	1.00	.98	.031

Note: NFI = Normed fit index; NNFI = non-normed fit index; CFI = comparative fit index; AGFI = adjusted goodness of fit index; RMSEA = root mean square error of approximation (N=517).

The assessment of the fit between the hypothesized TAM fitted to the sample data suggests the model fits, explaining the covariation in the data. Overall, the hypothesized model accounted for 61 percent of the variance in the construct of intention to use. The squared multiple correlations indicate that an ample portion of each variable is explained, with the exception of reading strategies gains having .00078 of the variation explained by social presence (see Table 3). All the path coefficients between the variables in the model were significant ( $p < .05$ ). The factor loading analysis revealed that perceived ease of use on perceived usefulness was one of the highest standardized path coefficient at .55 within the original TAM structure. This result concurs with past research findings. The lowest factor loading in within the original TAM was perceived ease of use on continuance intention (standardized path coefficient of .21).

An analysis of the path loadings for the each of the items provided the following results:

Table 3. Path Analysis Equations (Standardized)

Path to Variable	Path from Variable	Path Coefficient	t-value	Error variance	R <sup>2</sup>
Social Presence	SOC	.67	16.05	28.59	0.46
Perceived Ease of Use	SP	.55	16.05	20.02	0.31
Perceived Usefulness	PEU	.55	6.25	10.68	0.50
	SP	.23	16.05		
Continuance Intention	PU	.31	5.39	4.66	0.61
	PEU	.21	5.87		
	SP	.25	5.15		
	SOC	.19	16.05		
Reading Instructional Strategies Knowledge Gains	SP	.03	16.05	77.76	0.00078

Note: SOC=Sociability, SP= Social Presence, PEU=Perceived Ease of Use, PU=Perceived Usefulness, CI=Continuance Intention. All path coefficients were significant at the  $p > .01$  level. (N=517).

### Research Question 1

*Does the overall hypothesized Technology Acceptance Model (TAM) fit the data in predicting teachers' continuance intention of the online Teacher Professional Development (oTPD) course?*

This first question focused on the classic TAM's ability to predict the participants' intentions to continue using oTPD as mediated through the influence of perceived usefulness and perceived ease of use. The relationships were examined between perceived usefulness, perceived

ease of use, and continuous intention. Two variables--perceived ease of use and perceived usefulness--serve as indicators of the continuance intention factor. The standardized path coefficient of perceived usefulness to continuance intention was .31 and .21 for the standardized path coefficient of perceived ease of use to continuance intention.

The results of the analysis suggest that the hypothesized TAM fit the data and that perceived ease of use and perceived usefulness are predictors of teachers' intentions to continuing using online professional development with perceived usefulness being the stronger predictor of the two variables.

## Research Question 2

*To what extent does sociability and social presence impact the TAM?*

This second research question focused on the extension of the TAM to include the external constructs of social presence and sociability. The hypothesized model measured the direct and indirect impacts of social presence and sociability on the TAM's ability to predict the participants' intentions to continue using oTPD as mediated through the influence of perceived usefulness and perceived ease of use. Sociability was predicted to impact the model indirectly through the social presence construct, and social presence was predicted to directly influence perceived ease of use and perceived usefulness. In addition, the proposed model included sociability and social presence as direct indicators of the continuance intention factor.

The standardized path coefficient of sociability to social presence was .55 and indicated a significant positive relationship between these two variables. The R-square value was .46, which suggests that sociability explains almost half of the variation in the social presence construct.

Sociability appeared to have little direct impact on the overall TAM; however, sociability does have a significant impact on the model indirectly through a strong influence on social presence. The standardized path coefficient from social presence to perceived usefulness was only .23, suggesting little influence, while the direct effect to perceived ease of use was significantly higher at .55. Social presence has a stronger indirect impact on continuance intentions than direct through perceived usefulness and perceived ease of use. The direct influences on continuance intentions of sociability and social presence were low with the standardized path coefficients for social presence on continuation intention as .25 and only .19 for sociability on continuation intention.

The perceptions of social presence and sociability on the overall TAM model are significant and suggest that these variables do impact users' perceptions of perceived ease of use.

### Research Question 3

*To what extent does social presence impact knowledge gains in an oTPD based program?*

The third question was considered based on past research findings that social presence has a significant impact on student performance. In contrast, although the results of this study indicated a significant relationship between social presence and instructional reading strategies gain scores, the impact was weak. The path coefficient was .00078 which indicates that social presence is not contributing substantially to performance. Further analysis suggest that the results of the instruments maybe unreliable do to the fact that the tests were administered online without verification of the test taker and performance on the tests were not a factor in the participants

overall course assessment. The removal of outliers made diminutive impact on the overall results of the analysis.

## Data Characteristics

### *Reliability*

Five scales were used to measure perceived usefulness, perceived ease of use, social presence, sociability, and continuance intention. Perceived usefulness scale and perceived ease of use had five items each; sociability and social presence had nine items each continuance intention, three items.

An internal consistency reliability testing for those seven scales was examined, using SPSS version 12.0 for Windows. Table 4 delineates the results of the reliability testing.

Table 4. Internal Consistency Reliability Coefficients

Cronbach Alpha for Scores on Instruments	
Perceived Usefulness (PU)	0.850
Perceived Ease of Use (PEU)	0.847
Social Presence (SP)	0.829
Continuance Intention (CI)	0.839
Sociability Scale (SS)	0.871

The Cronbach Alpha Coefficients exceeded .80 and were deemed satisfactory for scores obtained on all five measures.

In Table 5 variables are presented that include frequency and intensity. Mean scores vary according to the number of items within each construct scale. Perceived usefulness and perceived ease of use had the same level of scales with mean scores of 21.27 and 20.52 respectively with a maximum score of 25 possible points. Social presence and sociability had the same scale level with a maximum score of 45 and mean scores of 33.63 and 28.97 respectively.

Table 5. Frequency and Intensity of Variables

Variable	Mean	SD	Sum	Minimum	Maximum
Perceived Usefulness (PU)	21.27	4.61	10997	5.00	25.00
Perceived Ease of Use (PEU)	20.52	5.37	10608	5.00	25.00
Social Presence (SP)	33.63	7.25	17389	9.00	45.00
Continuance Intention (CI)	12.11	3.44	6259	3.00	15.00
Sociability (SS)	28.97	8.91	14975	9.00	45.00
Instructional Reading Strategies					
Knowledge (IRSK)	9.87	8.80	5103	-27.00	35.00

Note. SD = standard deviation.

### Demographics

Participants were purposely sampled based on their enrollment in a statewide oTPD course. Demographics and characteristics of the respondents are provided in Tables 6 and 7. The initial selected population consisted of 1,905 students that had enrolled in an oTPD course entitled “Competency 2: Foundations of Research-Based Practices.” Of these subjects, 752 (39%) responded to the study and 517 (27%) of those subjects qualified for use in the analysis.

Participation in the study was on a voluntary basis and names and email addresses were kept confidential. The course was offered through a public university using a WebCT platform. Accessing the course online was mandatory since all components of the course were delivered through the web-based system. Ages ranged from 20 years of age to older than 60 years of age. The majority of the respondents 460 (89%) indicated their age as 20-55 and 57 (11%) were 55 or older. The majority of the respondents were female (83.9%), while 16.1 percent were male. Eighty-eight percent (88.8%) of the respondents indicated they were PK-12 teachers. Eighty-nine percent (89.4%) indicated they had teaching experience. Of those the majority had less than 6 years teaching experience (42.7%), 28.2 percent had 7 -18 years experience, and 10.6 percent had no teaching experience. Nearly half the respondents (43.9%) had never taken an online course previously. The major ethnic groups indicated by the respondents were 9.9 percent African Americans, 74.1 percent Caucasian, and 8.5 percent Hispanic and 7.2 percent indicated other. Ninety-one percent of the participants (91.1%) indicated that they worked full-time.

Reasons for taking the course varied among respondents. Eighty-seven percent (87.2%) were taking the course to meet the state's reading endorsement requirement. Twenty-four percent (24.4%) took the course because they could not locate a traditional face-to-face course. Sixty-nine percent (69.4%) indicated that they took the course because it was convenient. Tables 6 and 7 give a detailed breakdown of the respondents' characteristics.

Table 6. Demographics of Respondents

	Sum	Percent
<b>Gender</b>		
Female	434	84%
Male	83	16%
<b>Ethnicity</b>		
African American	51	10%
Asian or Pacific Islander	4	1%
Caucasian	383	74%
Hispanic	44	8%
Native American	4	1%
Other	31	6%
<b>Age</b>		
20-30 years old	110	21%
31-40 years old	141	27%
41-50 years old	126	24%
51-60+ years old	140	27%

Table 7. Characteristics of Respondents

	Sum	Percent
Previous fully online courses taken previous		
None	227	44%
1-2	140	27%
3-5	78	15%
6+	72	14%
Are you a PK-12 teacher		
Yes	459	89%
No	58	11%
Number of years teaching experience		
Less than 1 year	33	6%
1-6 years	188	36%
7-12 years	87	17%
13-18 years	59	11%
19+ years	95	18%
Not reported	55	11%
Hours per week on the online course		
1-5 hours	194	37%
6-10 hours	227	44%
11-20 hours	75	15%
20+ hours	21	4%
Enrolled because could not find tradition face-to-face course?		
Yes	126	24%
No	366	71%
No response	25	5%

### Summary

The original technology acceptance model constructs replicated within this study focused on the relationships among three major constructs: perceived usefulness, perceived ease of use, and continuance intention. The proposed hypothesized model was expanded to factor in sociability and social presence with the TAM. An outcome variable of gains scores was also

included and calculated from pre – post test scores that measuring the increase of instruction reading strategies knowledge of the participants who completed the online teacher professional development course. Five instruments were adapted and utilized to measure these constructs using a five-point Likert scale. The path analysis was conducted on the scale level, not on an item level. Data was collected in the Spring of 2006 (N=517). The results of the overall model demonstrated a goodness of fit based on various model fit scales ( $\chi^2 = 9.03$ , *df*: 6 (p=0.17173, RMSEA=0.031). However, the positive impact of social presence on performance (gains) within this model was weak and did not reflect the same results of past research studies.

## **CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS**

### **Purpose of the Study**

There is an increasing and critical need to provide high-quality teacher professional development to classroom teachers that will improve their skills to instruct a growing diverse student population, to effectively integrate new instructional technologies into the classroom, and to keep current with global changes, new information, and scientific advancements (Ketelhut, McCloskey, Dede, Breit, & Whitehouse, 2006). Online teacher professional development offers a promising solution to address this problem. However, the success of online technology for teacher professional development is dependent upon teachers' acceptance and use of web-based technologies to deliver professional development as an alternative to traditional face-to-face delivery. The acceptance of oTPD by teachers has not been entirely understood and is of critical importance to realize the full potential of oTPD and have the optimal return on investment. To the best of this researcher's knowledge, this study is one of the only attempts to investigate teachers' acceptance of oTPD using the TAM in the U.S.

The primary goal of this study was to determine whether Davis' (1989) Technology Acceptance Model (TAM) could be used to measure technology acceptance of online teacher professional development (oTPD). This study explored the mediating effects of the perceptions of ease of use and usefulness on teachers' intention to continue using oTPD. Researchers have suggested that one of the disadvantages of the TAM is that it does not fully consider the effects of external contextual variables. Therefore, a secondary purpose of this study was to expand the model to encompass the external impacts of sociability and social presence on perceived

usefulness and perceived ease of use. Past research studies of online social presence and sociability have indicated that these variables have a significant positive impact on student satisfaction when using online courses and their performance within an online course (Aragon, 2003; Gunawardena & Zittle, 1997; Kreijns, et al., 2004b; Richardson & Swan, 2003). The third and final purpose of this study was to consider the impact of social presence on gains in participants' content knowledge within an oTPD setting. Performance of teachers in oTPD is an important outcome when determining the effectiveness of online instruction and has rarely been reported in the context of oTPD (Dede, 2006).

### Summary of Major Findings

First, the data suggest that the hypothesized TAM was a successful model to use when trying to predict participants' intentions to continue using oTPD in the future. The majority of the relationships hypothesized between the variables were supported by the data and the paths were all significant at the  $p < .01$  level. However, the associations between variables were somewhat weak with standardized path coefficients measures at or below .55. The two major constructs, perceived usefulness and perceived ease of use had the highest direct impact on participants' continuance intentions. The finding in this study in regards to the positive influence of perceived usefulness and perceived ease of use on participant intentions aligns with past research studies of the TAM (Adams, et al., 1992; Lee, Y., et al., 2003; Roca, et al., 2006; Venkatesh & Davis, 2000).

Usefulness had the single highest influence on continuance intentions (standardized path coefficient of .31). This reflected the perceptions of participants of how useful online

professional development is in enhancing their performance in the course, in their classroom instruction, and in making it easier for them to access teacher professional development learning opportunities. This collaborates with other research findings that suggest the teachers' perceptions as to the usefulness or relevancy of the professional development to their classrooms is of high importance when choosing to participate in any professional development whether face-to-face or online (Garet, et al., 2001; Guskey, 2000; Holland, 2005; Schlager & Fusco, 2003).

The timing of the data collection at the end of the course may have caused the weak correlation of perceived ease of use on continuance intention. The weak link between ease of use and continuance intentions was expected and coincides with findings in other research studies. Participants would have become fairly proficient with the online course by the time the questionnaire was distributed (7-10 weeks after the start of the course) and would not have been as concerned with the ease of using this type of technology in the future. This finding also coincides with past research studies using the TAM (Adams, et al., 1992; Lee, et al., 2003; Roca, et al., 2006; Venkatesh & Davis, 2000). Future studies should consider measuring participants' perceptions using a time series approach.

Second, the results of the analysis of the expanded external variables revealed that sociability and social presence had a significant impact on the TAM. Sociability had a strong positive direct relationship with social presence, having the highest standardized path coefficient measure within the structured model of .67. This was expected since the emergence of social presence would be highly dependant upon a system's ability to facilitate the social interaction within the web-based course (Kreijns, et al., 2004a, 2004b). Sociability had little direct effect on continuance intention with a standardized path coefficient of only .19.

Social presence had a statistically significant influence on perceived ease of use with a standardized path coefficient of .55. This could have been a result of the high level of technical support and communication provided from FOR-PD staff to the participants and the level of communication of the FOR-PD facilitators on how to use the features of the online course. The special seven week training course provided to all FOR-PD facilitators could have improved the facilitators' ability to strengthen the interaction among students and themselves as the facilitators of the course. The high level of social presence could have diminished the sense of isolation and possibly built a feeling of student camaraderie when trying to learn their way around the online course modules. Most of the participants were first time users of online course work with 44 percent indicating this as their first course online and 27 percent having experience with only one or two previous online courses. Interacting with other participants would have enabled them to ask questions and feel more at ease with using a new technology.

In contrast, social presence had a weaker positive influence on perceived usefulness, which was unexpected (standardized path coefficient of .23). This researcher anticipated there would be a strong correlation between social presence and usefulness as teachers shared with each other how they were using the course content within their own classrooms. In support of that expectation were research studies focused on the impact of online communities of teachers that interact in order to improve classroom instruction (Anderson & Harris, 1997; Schlager & Fusco, 2003). The previous perceptions and experiences of participants about online instruction could have influenced a lower influence than expected. Another possible explanation would be that the data-gathering instrument was inadequate and did not include explicit questions concerning teachers sharing the application of the course content within their classrooms. In addition, the course had a total number of thirteen assignments with only three collaborative

assignments; the remaining ten were assignments where the participants worked independently. It is possible that requiring more collaborative assignments could increase the level of interaction among the teachers and increase the impact of social presence on perceived usefulness.

Third, the influence of social presence on performance was weak although statistically significant ( $t = 4.85$ ) having the lowest standardized path coefficient within the model of only .03. This may have been the result of participants not responding to the post-test due to the fact it did not have any impact on their course grade. Several scores were quite lower than the pre test score and seemed somewhat suspect. In addition, the using gain scores on the pre and post test as the only indicator for the performance measure could have disrupted the path analysis results. Similar findings have been published concerning the lack of significant effect of social presence and performance (Hayashi, et al, 2004; Picciano, 2002).

The primary goal of this study was met by determining that the TAM is a viable model to predict continuance intentions of teachers in regard to using oTPD. The hypothesized model explained over half of the variance of continuance intention with a respectable  $R^2$  of .61 and all the fit indices indicated the model was an excellent fit.

### Significance of the Findings

One important contribution of this research is that it extends the application of the TAM to teachers' acceptance of online teacher professional development. A paucity of research has specifically examined teacher acceptance of oTPD, so the current study provides new information to educational leaders and policy-makers that may be useful in understanding teachers' acceptance and use oTPD (Whitehouse, et al., 2006).

Perceived usefulness was found to be a key variable for the acceptance and usage of oTPD. The implications of these results suggest that instructional designers should stress the connections between the content of the professional development and its relevance to the classroom for teachers when developing oTPD courses. In addition, this study furthers our understanding of the direct and indirect influences on teachers' intentions to continue using oTPD.

This research study addresses an important gap in the literature by examining the significant effect of social presence and sociability on the acceptance of oTPD. The fact that the sociability of the system notably influences social presence is a key finding that underscores the importance of a web-based system to facilitate interaction among users within an online environment. Without easy access to discussion boards, email, and other types of interactive connections between online users, social presence would not emerge. The lack of social presence would have a detrimental impact on teachers' perceptions of the ease of use when using oTPD and may discourage teachers from completing a course or discourage them from continuing to use oTPD in the future.

### Limitations

The research study gathered data from a single study using 123 online course sections within one specific course at a specific university in one semester using a WebCT platform, which limits the generalizability of the results. Moreover, classroom educators tend to be overwhelmingly female. 84 percent of the participants were female in this study, which may have biased the results. There was no attempt to gather perceptions of experiences and

interactions from the students who did not respond to the questionnaire or officially withdrew from the course before the end of the semester. In addition, the questionnaire was not distributed until the end of the course; therefore students that may have had difficulties with the online setting would have already dropped the course early in the semester.

The design and implementation of this oTPD course is of importance when considering the generality of the results and the various types of delivery models available for oTPD. FORPD provided a online teacher facilitators for all sections of the course. There are other oTPD that are web-based and are not moderated by a course facilitator nor do the participants have access to a facilitator or instructor as they progress through a series of learning modules. Having an online teacher facilitator or instructor could influence the participants' perceptions of the level of social presence within the course.

### Recommendations for Further Research

Longitudinal research is necessary to verify if the continuance intention results in fact measure teachers' future usage of oTPD. Further research studies are also needed using this model to determine if the relationships hold under different course oTPD settings. The timing of the data collection should include multiple gatherings at different stages of the course.

Perceptions of the variables should change over time and a time series approach to gathering data on perceptions could give a better understanding of the process to technology adoption in oTPD.

A larger number of variables would have allowed the model to account for a greater portion of variance. This study only covered four key variables and was not exhaustive of other potential influences on the acceptance and use of oTPD. It is anticipated that inclusion of other

variables such as subjective norms could be explored to better predict intentions to use and increase the explanation power of the model.

Future research should examine the effect of prior experience with online courses on the acceptance of oTPD. Education leaders need to know if a teacher has a bad experience in one course, will that prevent the teacher from attempting to take another oTPD course and how to best design courses that will motivate teachers to continue using oTPD throughout their professional careers.

In addition, research should closely examine how teachers determine the relevance of oTPD when choosing to enroll in a particular course. This would help designers to motivate teachers to participate in online professional development by strongly emphasizing the usefulness of the course.

When examining the effectiveness of oTPD in the future, better research methods are needed that will address three main questions: teacher learning, teacher change, and improved student achievement (Holland, 2005; Ketelhut et al., 2006). This may be accomplished through developing better measurement instruments.

## **APPENDIX A: FOR-PD COURSE OUTLINE**

## FOR-PD Course Outline

(Reproduced from the FOR-PD website:

[http://www.itrc.ucf.edu/forpd/courseinfo/course\\_outline.html](http://www.itrc.ucf.edu/forpd/courseinfo/course_outline.html)

### **Lesson 1: Introduction to the FOR-PD Course**

What's all the buzz about FOR-PD? Lesson 1 will provide you with an introduction to the FOR-PD course. You'll learn more about the FOR-PD project and why it is important to Florida. You will also have the opportunity to become more comfortable with the technology tools used the course by viewing tutorials and using the tools. Finally, you will "meet" your classmates and your facilitator in the course discussion area.

### **Lesson 2: Reading and Learning to Read**

Some people think that "learning to read" happens only in primary grade classrooms. Learning to read is a continuous process and all educators should be informed about it. This lesson is designed to provide you with a review of key research and theory on effective beginning reading instruction and the factors that effect students' reading development. In the classroom application section, you'll find practical applications and information, including links to websites that will help you foster community and family involvement in your classroom.

### **Lesson 3: Exemplary Reading Instruction**

What does truly exemplary reading instruction look like? This lesson answers that question by providing you with a review of the research into exemplary reading instruction and helping you translate research-based principles into sound classroom practice. You will also learn more about key state and national reading initiatives and how they impact your life as an educator. In the classroom applications section, you will find resources that will help you organize a balanced literacy program.

### **Lesson 4: Language and Print-Rich Environments**

Lesson 4 will guide you in developing a print-rich environment likely to encourage and motivate your students to read and to love reading. You'll read descriptions, look at examples, visit websites, and see resources that will show you how to make your classroom literacy-rich. You will also explore the characteristics of the different stages of reading development.

### **Lesson 5: Phonemic Awareness and Phonics**

In Lesson 5, you'll learn about research-based strategies that will engage your students in phonics and phonemic awareness to help them develop the skills necessary to effectively decode text. You'll also become familiar with the goals Florida Governor Jeb Bush and President George W. Bush have set for the state and the nation. In this lesson, the authors present a detailed case for the importance of phonemic awareness in reading development.

### **Lesson 6: Bringing Students and Text Together**

Lesson 6 is designed to help teachers get students engaged *in* and excited *about* reading. Students need to be motivated to read and the best way to do that is to make reading enjoyable.

You will be provided with numerous strategies to help you get students to make connections with the text by activating their prior knowledge. You'll also visit websites that demonstrate how to implement these strategies in your classroom. Finally, you will learn how to help your students choose the right books for their reading level and interests.

### **Lesson 7: Strengthening Vocabulary Development**

Are you tired of relying on word lists to teach vocabulary to your students? Lesson 7 offers exciting alternatives to the old word list approach. In this lesson, you'll find information about teaching vocabulary, teaching students how to learn new words, using word play in your classroom, and assessing students' vocabulary development. You will also find an assortment of resources to help you expand your students' vocabulary, including graphic organizers and other proven word learning strategies.

### **Lesson 8: Scaffolding Students' Comprehension and Guiding Students toward Independence in Reading**

In the 21<sup>st</sup> century, citizens are expected to comprehend and use information from a variety of complex sources. Have you ever worried that your students may not be developing the comprehension skills they need? Lesson 8 will provide you with many practical strategies that promote comprehension and fluency. You will also learn about the factors that influence the development of comprehension and effective ways to assess and monitor student comprehension.

### **Lesson 9: Integrating Reading and Writing across the Curriculum**

Studies have shown that teaching reading and writing together leads to improved student achievement in both areas. In this lesson, you will explore the relationship between the reading and writing processes and find exciting ways to integrate reading and writing across the curriculum. Additionally, you will uncover many practical suggestions for implementing integrated reading and writing activities in your classroom. Finally, you will discover a wealth of information about assessing literacy in content area classrooms and using authentic assessment.

### **Lesson 10: Teaching for Understanding in Content Areas**

Reading is an integral part of all content areas--whether you teach science, math, social studies or any other subject. Lesson 10 is designed to offer an overview of content area reading and to identify key factors in developing successful readers in content area subjects. You will also discover resources and strategies to increase student achievement by activating prior knowledge and improving thinking skills. Finally, the classroom applications section contains many useful, content-specific links.

### **Lesson 11: Literacy Instruction and Non-native Speakers of English**

The number of limited English proficient students entering the public school system in Florida is increasing every year. Consequently, all educators will need to develop strategies to teach and reach ESOL students. This lesson will help you do just that! We will address the challenges brought to the classroom by ESOL learners and will discuss both general and specific guidelines for teaching students of diverse cultural and linguistic backgrounds. Of course, you will also find many specific classroom strategies and resources to help you enhance the literacy learning of your ESOL students.

### **Lesson 12: Literacy Learning for Struggling Readers**

We believe all students can learn to be successful readers! Research suggests that, though struggling readers are lacking knowledge and practice, they can be taught to be successful when reading. The ideas and activities presented in this lesson are designed to familiarize you with strategies that support literacy learning for readers who struggle when reading. In this lesson, you will learn many strategies to enhance the decoding ability, vocabulary and comprehension of your struggling readers. You will also see specific applications for assisting struggling readers in content area classrooms.

### **Lesson 13: Assessment**

Ongoing assessment serves a variety of important purposes and is critical to any reading program. In this lesson you will gain knowledge of how to assess students' reading development and how to use assessment data to plan for instruction. You'll also find links to resources for reading assessment, authentic assessment, test preparation, the FCAT and DIBELS.

### **Lesson 14: Becoming an Effective Literacy Leader**

In this lesson we will discuss research-supported strategies for implementing effective school-wide literacy improvement programs. You may choose to explore this topic from either the perspective of an administrator or a teacher. Both paths contain valuable information about how to prioritize literacy and support school-wide achievement gains at your school. Reflection, action research, and effective professional development can help you bring about change in your classroom and school

**APPENDIX B: UCFIRB PERMISSION LETTER**



Office of Research & Commercialization

April 24, 2006

Jo Ann Smith  
2259 Red Ember Road  
Oviedo, FL 32765

Dear Ms. Smith:

With reference to your protocol #06-3460 entitled, **“Research on Participants Perceptions and Attitude towards Online Teacher Professional Development,”** I am enclosing for your records the approved, expedited document of the UCFIRB Form you had submitted to our office. **This study was approved on 4/23/06. The expiration date will be 4/22/07.** Should there be a need to extend this study, a Continuing Review form must be submitted to the IRB Office for review by the Chairman or full IRB at least one month prior to the expiration date. This is the responsibility of the investigator. **Please notify the IRB office when you have completed this research study.**

Please be advised that this approval is given for one year. Should there be any addendums or administrative changes to the already approved protocol, they must also be submitted to the Board through use of the Addendum/Modification Request form. Changes should not be initiated until written IRB approval is received. Adverse events should be reported to the IRB as they occur.

Should you have any questions, please do not hesitate to call me at 407-823-2901.

Please accept our best wishes for the success of your endeavors.

Cordially,

A handwritten signature in cursive script that reads 'Barbara Ward'.

Barbara Ward, CIM  
UCF IRB Coordinator  
(FWA00000351 Exp. 5/13/07, IRB00001138)

Copies: IRB File  
Stephen A. Sivo, Ph.D.

BW:jm

## **APPENDIX C: INFORMED CONSENT NOTICE**

## *Informed Consent Form*

**Please read this consent document carefully before you decide to participate in this study.**

**Project title:** Research on Teachers' Perceptions & Attitude Towards Online Teacher Professional Development

**Purpose of the research study:** The purpose of this study is to understand the relationship between attitude toward online teacher professional development use and actual use of online professional development.

**What you will be asked to do in the study:** The survey questions ask about your perceptions and attitudes toward online instruction.

- This survey is completely voluntary. You may choose not to participate or not to answer any specific questions. You may skip any question you are not comfortable answering. You can decline to participate in this survey without affecting your grade or class standing. There are no anticipated risks.
- Do not take this survey if you are under the age of 18.
- Your responses to this questionnaire and course data will be analyzed and reported anonymously to protect your privacy. Your information will be assigned a code number. The list connecting your name to this number will be kept in a locked file safe in the Center for Educational Research (CERD) office. When the study is completed and the data have been analyzed, the list will be destroyed. Your name will not be used in any report.
- There is no compensation or other direct benefit to you for participation.
- This study examines student perceptions, beliefs, and attitudes related to online instruction. The information will be used to evaluate the relationship between attitude toward online teacher professional development and use of online teacher professional development.
- Please answer questions honestly.
- Your privacy and research records will be kept confidential to the extent of the law. Authorized research personnel, employees of the FOR-PD Project, the UCF Institutional Review Board and its staff, and other individuals, acting on behalf of UCF, may inspect the records from this research project.
- The results of this study may be published. However, the data obtained from you will be combined with data from others in the publication. The published results will not include your name or any other information that would personally identify you in any way.
- If you have any questions about this survey or comments about this research, please contact Jo Ann Smith (joasmith@mail.ucf.edu, 407-823-3766) or her supervisor, Dr. Stephen Sivo (ssivo@mail.ucf.edu, 407-823-4147).

- Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (IRB). Information regarding your rights as a research volunteer may be obtained from: IRB Coordinator, Institutional Review Board (IRB), University of Central Florida (UCF), 12201 Research Parkway, Suite 501, Orlando, Florida 32826-3246. Telephone: 407-823-2901.
- The online survey will take approximately ten minutes to complete. You can complete the survey right now, or anytime up until 5/29/2005.

**By clicking on the link, you agree to voluntarily participate in this study.**

To complete the survey online, click on the following link:

**<http://edcollege.ucf.edu/test/testsurvey.cfm>**

## **APPENDIX D: QUESTIONNAIRE INSTRUMENT**

### **Perceived Usefulness (PU) Items**

Five-point Likert scale (1 = strongly agree; 2 = somewhat agree; 3 = neutral, 4 = somewhat disagree; 5 = strongly disagree).

- PU1 Using online professional development improves my ability to perform well in the professional development training
- PU2 I think that online professional development such as this course should be available to all classroom teachers
- PU3 Using this online professional development would enhance my performance in the classroom
- PU4 Using this type of online professional development would make it easier for me to access teacher professional development learning opportunities
- PU5 Using online professional development would make it easier for me to increase the quality of instruction in the classroom

### **Perceived Ease of Use (PEU) Items**

Five-point Likert scale (1 = strongly agree; 2 = somewhat agree; 3 = neutral, 4 = somewhat disagree; 5 = strongly disagree).

- PEU1 This online course environment is easy to use
- PEU2 It is easy to become skillful at using the online course
- PEU3 Learning to navigate through the online environment is easy
- PEU4 The online course is flexible to interact with
- PEU5 I find this online professional development course easy to use

### **Sociability Scale (SS) Items**

Five-point Likert scale (1 = not applicable at all; 2 = rarely applicable; 3 = moderately applicable; 4 = largely applicable; 5 = totally applicable).

- SS1 I do not feel lonely in this online professional development environment
- SS2 This online professional development environment enables me to get a good impression of my classmates
- SS3 This online professional development environment allows spontaneous informal conversations
- SS4 This online professional development environment enables us to develop into a well-performing team of classmates
- SS5 This online professional development environment enables me to develop good work relationships with my classmates
- SS6 This online professional development environment enables me to identify myself with the class
- SS7 I feel comfortable with this online professional development environment
- SS8 This online professional development environment allows for non task- related conversations
- SS9 This online professional development environment enables me to make close friendships with my classmates

### **Social Presence Scale (PS) Items**

Five-point Likert scale (1 = strongly agree; 2 = somewhat agree; 3 = neither agree nor disagree; 4 = somewhat disagree; 5 = strongly disagree).

- SPS1 When I have email correspondence in this online professional development environment, I have my communication partner in my mind's eye
- SPS2 When I have conversations on the discussion board in this online professional development environment, I have my communication partner in my mind's eye
- SPS3 I felt that my point of view was acknowledged by other participants in the online course
- SPS4 When I have email correspondence in this online professional development environment, I also feel that I deal with very real persons and not with abstract anonymous persons
- SPS5 When I have conversations on the discussion board in this online professional development environment, I also feel that I deal with very real persons and not with abstract anonymous persons
- SPS6 Discussion board conversations in this online professional development environment can hardly be distinguished from face-to-face conversations
- SPS7 Messages in the online course were impersonal (Reverse)
- SPS8 The facilitators created a feeling of online community
- SPS9 The facilitators supported discussions in the online professional development course

### **Continuance Intention (CI) Items**

Five-point Likert scale (1 = strongly agree; 2 = somewhat agree; 3 = neither agree nor disagree; 4 = somewhat disagree; 5 = strongly disagree).

- CI1 I would choose to use online professional development on a regular basis in the future
- CI2 I would choose to frequently use online teacher professional development in the future
- CI3 I would strongly recommend others to use online teacher professional development

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