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Analysis of Factors That Influence Use of Learning Management Systems by Pennsylvania Rural School Districts

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ANALYSIS OF FACTORS THAT INFLUENCE USE OF LEARNING MANAGEMENT SYSTEMS BY PENNSYLVANIA RURAL SCHOOL DISTRICTS

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The purpose of this study was to explore the factors that influence administrators in three rural Pennsylvania school districts to continue using a Moodle learning management system (LMS) and discover teacher perceptions and other factors that affect the use of Moodle in these school districts.

Using a mixed explanatory design, the researcher determined that teachers' opinions on why a school district subscribes to an LMS or how successful a school district is in meeting its goals for using an LMS had no effect on their level of LMS use. Also, the teachers' level of LMS use was not affected by encouragement from other teachers or school district administrators. However, it was discovered that perceived usefulness and perceived ease of use were factors that affected the teachers' level of LMS use.

Administrators from each participating school district indicated a unique factor that prompted them to continue using Moodle. These factors were: (a) the continued need to facilitate elective courses for one district's cyberschool program, (b) the gaining popularity of Moodle due to teachers becoming more familiar with it, and (c) the need for increased collaboration among faculty within one district's teacher induction program.

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CHAPTER 1

THE PROBLEM

Statement of the Problem

In regards to literature addressing whether Learning Management System (LMS) technology is effective at meeting K-12 schools' rationales for implementing it, researchers do agree that schools are trying to improve their students' academic progress by using LMSs, whether the decision to do so was their own or influenced by their countries' governments. They also conclude that teacher commitment and sufficient infrastructure are the main factors that contribute to LMS use at the K-12 level. However, the literature tends to focus mostly on models and best practices for implementation. Consequently, other factors that contribute to the schools' level of LMS use are generally ignored.

School districts adopt LMS technology in an attempt to provide their students with more educational opportunities than they currently receive. Some school districts use it as a means to augment curriculum with distance education courses (Reid, Aqui, & Putney, 2009), enabling students to take courses that their schools are unable to offer, such as a particular language or advanced placement course. Other school districts use it to service students who do not attend their schools, either by choice (Reid et al, 2009) or extenuating circumstances such as health issues or remote geographical locations (Kirby, Sharpe, Bourgeois, & Greene, 2010). LMSs have also been implemented to help motivate vocational students to utilize technology (Acevski, Acevska, & Fahlberg-Stojanovska, 2012).

In addition to these internal reasons, school systems throughout the world have begun using LMSs due to government initiatives. For example, the Government of Qatar established an initiative to promote educational technology in 2004 that led to the development of an LMS that

was intended to be introduced to all 164 independent schools in the country (Nasser, Cherif, & Romanowski, 2011). A similar initiative was presented in Singapore, where an elementary school adopted a Moodle LMS in part to be a model for seamless and pervasive integration of technology into the curriculum (Tay, Lim, Lye, Ng, & Lim, 2011). Also, schools in Tanzania are looking to use LMSs in order to help their country achieve one of the attributes of its national development vision, becoming a well-educated and learning society (Simba, Trojer, Mvungi, Mwinyiwiwa, & Mjema, 2009).

Ultimately, the success of an LMS implementation in a school depends on commitment from the teachers. If the teachers do not take the time to provide engaging content and actively participate in the LMS, the students will most likely avoid using it as well (Nasser et al., 2011; Tay et al., 2011). In addition, getting teachers to commit to changing the way they teach in order to incorporate an LMS into their courses takes time, in some instances a year or more (Acevski et al., 2012). Infrastructure also plays a major role in the success or failure of these initiatives. In Tanzania, the majority of rural secondary schools do not have Internet access or even computers, which makes it difficult for that country's LMS initiative to reach them (Simba et al., 2009). At the other end of the spectrum, eight of Canada's 10 provinces have some form of province-wide online distance education program for their elementary and secondary schools, aided by the affordability and accessibility of technology and Internet access in that country (Kirby et al., 2010).

The literature suggests that teacher commitment and infrastructure are driving forces behind LMS use, if the technology is available, but does not clearly identify how teachers are motivated to use LMSs. For the most part, governments provide no incentives to schools for implementing LMSs despite rolling out initiatives (Nasser et al., 2011). In some instances, school

administrators are able to influence their teachers to use the LMSs (Pynoo, Devolder, Tondeur, van Braak, Duyck, & Duyck, 2011), but much of the available literature on this topic fails to explain whether teachers are following directives to use LMSs or motivating themselves. Actually, the majority of the literature features either implementations of LMSs at various secondary schools and universities (Reid et al., 2009; Lee, Lu, Yang, & Hou, 2010) or user perceptions toward the LMS (Papasterigou, 2007; Wen-Kai, Yu-Chih, & Yu-Jung, 2010), but usually not both. As a result, researchers in this field tend to present models and best practices (Pongsuwan, Hoksuwan, In-udom, & Chalakbang, 2011; Deperlioglu, Sarpkaya, & Ergun, 2011) as solutions to help increase the use of LMSs in the classroom while ignoring other factors that may be hindering this use.

Significance of the Study

Appalachia Intermediate Unit 8 (IU8) hosts a Moodle LMS for its 35 member school districts and five vocational-technical schools to administer online courses to their students. This service was launched in 2011. At that time, 13 school entities purchased annual subscriptions to use it. However, during the current school year (2014-15), only three school districts continue to have subscriptions to IU8's Moodle service, and the degree to which these entities use this LMS differs dramatically. One school district has posted 142 different courses on the system. The other two school districts have posted 46 and 22 courses, respectively.

The purpose of this dissertation is to explore the factors that influence these school district administrators to continue purchasing subscriptions for IU8's Moodle service and discover teacher perceptions and other factors that affect the use of Moodle in these three school districts. Unlike previous studies on this topic, this study's participants are given an opportunity

to express their feelings regarding LMS use in their own words due to the qualitative methodology mentioned later in this document.

Significance of the Problem

This problem is significant because little research has been published that focuses on how attitudes and other factors affect LMS use in U.S. elementary and secondary schools. Many studies have been conducted that address the use of an LMS in a classroom, whether at the high school or collegiate level. Some of the studies revealed attitudes of students and teachers toward LMS use (Wen-Kai, Yu-Chih, & Yu-Jung, 2010; Chen, Hwang, & Wang, 2011; Lee et al., 2010; Hussein, 2011). However, little research has been done in regards how these attitudes can affect LMS use (Hurd, 2009). Also, many studies focusing on LMS use have taken place around the world, but few have been conducted domestically (Little-Wiles & Naimi, 2011; Reid et al., 2009).

The results of this study will not only contribute to the body of knowledge regarding LMS use, but also give the IU8 Moodle administrators insight on why these school districts continue to use this service and why the disparity of use among these school districts exists. This information could be used by IU8 to help improve Moodle for the benefit of the school districts currently subscribed to the service. In addition, the IU8 Moodle administrators could use this information to offer suggestions to these school district administrators on how to increase their use of this service or market this service to school districts that are not currently subscribed to this service.

Quantitative Research Questions With Corresponding Hypotheses

As mentioned in the previous section, the researcher is investigating the reasons behind school district administrators purchasing subscriptions to IU8's Moodle service and teachers

using Moodle in these school districts. As a result, two quantitative research questions serve as the foundations for this study. The first research question addresses how teachers' opinions of Moodle affect their use of this LMS.

RQ_1: How do teachers' perceptions of an LMS affect their levels of use?

To answer this question, the researcher is grouping these perceptions into four categories: (a) opinion on why their school districts subscribe to IU8's Moodle service, (b) opinion on how successful their school districts are in meeting their goals for using Moodle, (c) perceived usefulness, and (d) perceived ease of use. The researcher is therefore testing the following four null hypotheses during this study:

H_1: There is no significant relationship between a teacher's opinion on why the school district subscribes to an LMS and the teacher's use of that LMS.

H_2: There is no significant relationship between a teacher's opinion on how successful the school district is in meeting its goals for using the LMS and the teacher's use of that LMS.

H_3: There is no significant relationship between a teacher's perceived usefulness of an LMS and the teacher's use of that LMS.

H_4: There is no significant relationship between a teacher's perceived ease of use of an LMS and the teacher's use of that LMS.

The second research question addresses how encouragement from a school district administrator or a colleague influences a teacher to use Moodle:

RQ_2: Do encouragements from others affect the teachers' level of use of the LMS?

To answer this question, the researcher is testing the following null hypothesis:

H_5: There is no significant relationship between how a teacher is encouraged to use an LMS and the teacher's use of that LMS.

Mixed-Method Research Questions

In order to gain a deeper understanding of what factors influence the teachers' use of Moodle, the following mixed-method research questions are addressed:

RQ_3: What are the perceptions of teachers in three IU8 school districts regarding use of an LMS in their classes?

RQ_4: How are teachers in these school districts encouraged to use an LMS?

Qualitative Research Questions

In order to gain a deeper understanding of why these school districts continue to subscribe to IU8's Moodle service, the following qualitative research questions are also addressed:

RQ_5: What factors are most influential for each school district to continue using the LMS?

RQ_6: How is the LMS helping these school districts meet their educational technology goals?

Definitions of Terms

Terms used in this study are defined as follows:

Bandwidth - A measurement of the ability of an electronic communications device or system (such as a computer network) to send and receive information (Merriam-Webster, n.d.).

Cyberschool – A school that delivers academic instruction predominantly through the Internet, so that students participate in or receive instruction in locations other than a classroom (Carr-Chellman & Marsh, 2009).

Discussion board (discussion forum) - Section of an LMS where students participate in asynchronous discussions on course-related topics by posting messages (Papasterigou, 2007).

Distance education - The transmission of educational content from an instructor in one geographical location to a student in a different geographical location via correspondence course format, audio-video tape, videoconferencing, television broadcast, or Internet (Jianfeng, Solan, & Ghods, 2010).

e-learning - The acquisition and use of knowledge distributed and facilitated primarily by electronic means (Al-alak & Alnawas, 2011).

Hardware - Physical components of a computer system (Fisher, 2013).

Learning management system (LMS) - Web-based software consisting of courses that contain electronic tools such as discussion boards, files, gradebooks, e-mail, announcements, assessments, and multimedia elements (Gautreau, 2011).

Perceived ease of use (PEOU) - The degree to which a person believes that using a particular system would be free of effort (Davis, 1989).

Perceived usefulness (PU) - The degree to which a person believes that using a particular system would enhance that person's job performance (Davis, 1989).

Plug-in - A small piece of software that adds a feature to a larger program or makes a program work better (Merriam-Webster, n.d.).

Software - Programs that run on a computer and perform certain functions (Merriam-Webster, n.d.).

Virtual community - An educational technology tool that uses fictional characters within a Web-based setting designed to enhance learning through situations and context (Giddens & Walsh, 2010).

Workgroup - A virtual space in an LMS, comprising of a document repository and a discussion board, assigned to groups of students collaborating on a common assignment or project (Papasterigou, 2007).

Assumptions

In his Diffusion of Innovations Theory, Rogers (1962) lists five categories of adopters regarding a new innovation: innovators, early adopters, early majority, late majority, and laggards. The very first users (or designers) of a particular technology are referred to as the innovators. After they release the technology to the public, the early adopters are the first people to use it after they see how it is demonstrated. In turn, the early adopters influence the early majority by showing them what can be done with the technology, the early majority influences the late majority, and, finally, the late majority influences the laggards. This process usually requires an extensive period of time. For example, in Ryan and Gross's study of hybrid seed corn adoption in Iowa (as cited in Lowery & DeFleur, 1995), the corn was first accepted by a small percentage of the farmers in 1927, which was 16 years before they published their study. Even at the time of publication, there remained a small percentage of farmers who did not adopt the hybrid seed corn for their crops. In regards to this particular study, IU8's Moodle LMS is currently in only its fourth year of existence. Using the Diffusion of Innovations Theory as justification, it is assumed that teachers in the school districts featured for this study fall into one of Rogers' (1962) adoption categories. Furthermore, it is assumed that within each school district, a small percentage of the teachers were the first to use Moodle for their courses in the 2011-12 school year. It is also assumed that a percentage of teachers are still not currently using Moodle despite being aware of the technology for the past four years.

The adoption rates of a given technology are influenced by perceived usefulness (PU) and perceived ease of use (PEOU). According to Davis (1989), people will use or not use a particular technology based on their belief that the technology will help them perform their job better. However, even if they believe that the technology is useful, they may also believe that it is too difficult to use and therefore the benefits of using it are outweighed by the effort required to use it (Davis, 1989). Consequently, an application that is perceived to be easy to use is more likely to be accepted by users (Davis, 1989), but that does not guarantee that the application would be the best one to use in a particular situation. Based on this argument, it is assumed for this study that an inverse relationship exists between the PU of the IU8 Moodle LMS and its PEOU.

Delimitations

The school districts selected in this study all currently subscribe to IU8's Moodle service. Although the selected school districts will assist in answering the research questions and testing the hypotheses mentioned earlier in this chapter, they also act as delimitations in this study. First and foremost, focusing only on school districts who subscribe to IU8's Moodle service limits the data to that which is based on the perspective that this LMS is always available to the teacher. Although the researcher is discovering why these school districts decided to subscribe to IU8's Moodle service, he is unable to find out why other school districts decided not to subscribe to IU8's Moodle service or whether teachers in those school districts would like to be able to use an LMS because those school districts are not involved in this study. Also, limiting the data to Moodle use within IU8 gives an opportunity for external factors such as IU8's culture and even Moodle itself to greatly influence the results. However, the qualitative methods described in

Chapter 3 provide the context to identify problems unique to IU8's culture or Moodle so that the results are somewhat generalizable to a larger population.

A portion of the data in this study is being collected using a survey that will be distributed to all elementary and secondary teachers within the three selected school districts. The total number of teachers in these school districts is 281, which in itself is considered small for obtaining quantitative data (Buddenbaum & Novak, 2001). In addition, this purposive sample by nature limits the researcher's ability to generalize a single study's results to a population (Johnson & Christensen, 2000). Therefore, the opinions presented by teachers from the three participating school districts may not necessarily reflect the opinions of teachers who use LMSs in other school districts within and outside of the IU8 service area.

Limitations

In addition to the surveys, interviews are being conducted with a small subsample of teachers and administrators from each school district. Although purposive sampling is used to find the most appropriate subjects to interview, it is possible that a number of the selected subjects may not be available for these interviews due to prior commitments, scheduling conflicts, or simply an unwillingness to participate. Also, it is possible that at least one of the selected school districts may decide to terminate their subscription to IU8's Moodle service sometime during this study due to financial or other reasons. As a result, the researcher may be required to find different subjects to interview or reduce the number of interviews, depending on the proposed timeframe of the study, which will affect the qualitative data that is collected.

CHAPTER 2

LITERATURE REVIEW

Introduction

The studies in this literature review illustrate that LMSs have the potential to enhance student learning by increasing efficiency of content distribution and teacher-student communication, but they have not been shown to single-handedly improve student learning. LMSs help keep students engaged through activities and online discussions. Students who are absent from class can keep up with current lessons and communicate with fellow students or their teachers by accessing an LMS. Also, the gradebook features of an LMS make it easier for teachers and students to monitor progress.

Although LMSs contain tools that provide on-demand access to content and communication, they can only be as effective as the infrastructure they are hosted on. Proper training and technical support are also vital for teachers to regularly use LMSs. In addition, not all LMSs are created equal. A few LMSs featured in the literature focused more on student management and communication than on course content. Despite the limitations, teachers are willing to adopt an LMS if they feel that it is capable of helping them present their curriculum. However, the LMS will not be useful for teachers if their students do not interact with it.

Theories Featured in the Literature

Teachers who believe LMSs are useful will more likely utilize them in their courses. Three theoretical frameworks that reflect this statement stand out in the literature. The Diffusion of Innovations Theory was featured throughout the literature, showing how selected LMS implementations followed this theory's stages of adoption. On the other hand, Socio-Technical Systems Theory was barely acknowledged, but provided suggestions for LMS implementation

success. Ultimately, the relationship between usefulness and acceptance is best shown by the Technology Acceptance Model. Throughout the literature, the Technology Acceptance Model was used to show how the perceptions of usefulness and ease of use contribute to LMS acceptance.

The Diffusion of Innovations Theory was introduced by Everett Rogers (1962), who defines the diffusion process as the spread of a new idea, referred to as an innovation, from its source of invention to its adopters via specific channels of communication in a social system over a period of time. This diffusion can be measured by a normal distribution adoption curve, which displays five categories of innovation adopters: innovators, early adopters, early majority, late majority, and laggards (Rogers, 1962). The innovators (2.5% of the distribution curve) are eager to try new ideas and introduce them to their local communities. The early adopters (13.5%) analyze the innovations and adopt them first. They are considered to be opinion leaders who determine whether the innovation is a success or failure. The early majority (34%) adopt the innovations just before the average member of a social system. They interact with their peers often, but seldom lead. The late majority (34%) adopt the innovations just after the average social system member. They usually adopt due to economic necessity or peer pressure. Finally, the laggards (16%) are the last group to adopt an innovation. They tend to be suspicious of new ideas and when they do adopt an innovation, it's usually superseded by a more recent idea that the innovators are using.

Implementations of LMSs at various institutions have followed the patterns described by the Diffusion of Innovations Theory. In the realm of adopting instructional technology, the categories of innovation adopters can be related to the amount of technology experience an instructor possesses (Sahin & Thompson, 2006). In turn, this experience can influence an

instructor's decision to begin using an LMS (Gautreau, 2011). Giddens and Walsh (2010) encountered initial resistance from selected faculty at their respective universities when they were implementing virtual communities into their nursing programs. These faculty members had no experience with and played no part in the creation of the virtual community, so they may have felt that the technology had no value compared to their own approaches to teaching (Giddens & Walsh, 2010). However, one small group of faculty quickly understood the potential of these communities and became early adopters, using them within their courses as soon as they were ready (Giddens & Walsh, 2010). Meanwhile, at Tel-Aviv University, adoption of a campus-wide LMS closely followed Rogers' (1962) curve of adoption percentages (Soffer, Nachimas, & Ram, 2010). Only 9% of the faculty adopted the LMS when it was released in 2000, but that percentage increased during each of the next six years, peaking at 80% in 2006 (Soffer et al., 2010). LMS activity at 10 Israeli secondary schools increased significantly during each of the three years of Blau and Hameiri's (2010) study, therefore also being consistent with the Diffusion of Innovations Theory.

Technology implementations can also be viewed from the perspective of Socio-Technical Systems Theory. In this literature review, Socio-Technical Systems Theory was the framework for only one LMS study, mainly to help explain ways to make LMS use successful at an academic institution. According to Socio-Technical Systems Theory, an organization consists of two interdependent systems: the technical system, which includes equipment and processes, and the social system, which consists of the people inside the organization (Ketchum & Trist, 1992). Traditionally, these two systems are often in conflict because people are expected to adapt to technology no matter what. However, Socio-Technical Systems Theory encourages these two systems to work together in order to succeed. According to Dillon and Morris (1996), the gainful

use of any technology hinges on the ability and willingness of users to employ it for tasks that are worthwhile, such as those that fall in line with an organization's goals. Therefore, any technology cannot be analyzed in a vacuum. The goals of the organization that the technology supports must be taken into consideration (Dillon & Morris, 1996), and work should be organized in a way that is compatible with the organization's objectives (Appelbaum, 1997). In regards to LMSs, the success of an online course can be affected by both the course design and the LMS design (Jianfeng et al., 2010). The course design represents the social system with the instructor designing the objectives, tasks, and other elements of the course. The LMS design represents the technical system because the instructor is dependent on the LMS for interface, structure, interaction and content (Jianfeng et al., 2010). For any design or redesign to happen, the impact that the social system and technical system has on each other must be taken into consideration and planning must aim toward both systems working in harmony (Cartelli, 2007).

The Technology Acceptance Model was used to show that teachers will use LMSs if they believe they will benefit from doing so. This model, introduced by Fred Davis (1986), is an adaptation of Ajzen and Fishbein's (1980) Theory of Reasoned Action that is specifically designed to model user acceptance of technology systems (Davis, Bagozzi, & Warshaw, 1989). Since its inception, the Technology Acceptance Model has been applied to different technologies with a variety of control factors and subjects. As a result, it has been considered by information systems researchers as a parsimonious and powerful theory (Lee, Kozar, & Larsen, 2003). Similar to how the Theory of Reasoned Action states that a person's intention to behave in a particular way is determined by that person's attitude toward that behavior and the subjective norm, the Technology Acceptance Model suggests that a person's behavioral intention to use technology is determined by that person's PU and attitude toward the technology, which is

actually a consummation of PU and PEOU (Davis et al., 1989). Therefore, according to Davis (1986), PU and PEOU are the two particular factors that can predict user acceptance of any technology. Davis (1986) defines PU as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 26). In other words, people tend to use or not use technology based on whether they believe it will help them do their job. PEOU is referred to as "the degree to which a person believes that using a particular system would be free of physical and mental effort" (Davis, 1986, p. 26). External variables such as system quality, training, management support, and experience were introduced to the Technology Acceptance Model over the years which helped researchers examine various factors that lead to technology acceptance (Lee et al., 2003).

In his work with the Technology Acceptance Model, Davis (1989) reasoned that even if a particular technology resource is found to be useful, people will not accept it if they feel that it is too hard to use. De Smet, Bourgonjon, De Wever, Schellens, and Valcke (2011) found this to be true in their study regarding LMS use in Belgian secondary schools. They discovered that PU and PEOU had a strong effect on informational use of an LMS. Venter, van Rensburg, and Davis (2012) also showed that PU and PEOU had significant relationships with LMS use in South Africa, although these relationships were shown to be comparatively weak to moderate. In addition, Hu, Clark, and Ma (2003) stated that PU was the most important determinant of teachers' technology acceptance. However, they found that PEOU by itself did not positively affect technology acceptance in their study, but PEOU could affect technology acceptance indirectly. In a similar fashion, PU was also found to have a positive effect on LMS use in a Korean university, but PEOU was not positively related to LMS user satisfaction (Lee & Lee, 2008).

Previous research has shown that PU and PEOU have ties to the Diffusion of Innovations Theory. As part of this theory, Rogers (1995) lists five perceived attributes of innovations: relative advantage, compatibility, complexity, trialability, and observability. Relative advantage is defined as "the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 1995, p. 212). This can be expressed in economic or social terms and is considered the best predictor for a person's decision to adopt an innovation. According to Moore and Benbasat (1991), relative advantage is the innovation attribute that shares the most similarities with PU. It has been revealed that relative advantage has significant positive effects on the PU and PEOU of e-learning systems in Taiwan (Lee, Hsieh, & Hsu, 2011). Compatibility is referred to as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 1995, p. 224). An idea that is more compatible is less uncertain to a potential adopter and fits more closely to that individual's situation. This compatibility gives a level of familiarity to the idea, which will likely lead to support of that idea. Compatibility also has positive effects on PU regarding e-learning systems (Lee et al., 2011). Rogers (1995) defines complexity as "the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 242). The more complex an innovation is, the less likely that innovation will become adopted. This attribute closely parallels PEOU (Moore & Banbaset, 1991). Although complexity was shown to have a negative effect on the PEOU of e-learning systems, it actually had a positive effect on PU (Lee et al., 2011). This was based on the notion that employees believed the e-learning systems helped improve their job performances despite being difficult to use. Trialability is "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 1995, p. 243). New ideas that can be tried out in stages are generally adopted quicker than innovations that are not divisible. In Lee et al.'s

(2011) study, trialability had a positive impact on PEOU. Finally, observability is defined as "the degree to which the results of an innovation are visible to others" (Rogers, 1995, p. 244). Rogers (1995) suggests that people are more likely to adopt an innovation if they can clearly see its advantage. However, observability has no significant effect on the PU or PEOU of e-learning systems (Lee et al., 2011).

Methods Used in Previous Studies

Throughout the literature, researchers have discovered how LMSs are used as instructional resources and communication tools. They have also offered suggestions for how to improve LMS use based on their findings. Surveys distributed to teachers were used to identify factors that encouraged or prevented LMS use. Two of these factors, PU and PEOU, have been measured in order to determine their role in LMS adoption. Reliable scales designed for measuring PU and PEOU have been duplicated or modified for use in subsequent LMS studies. Students have also responded to surveys, giving them an opportunity to offer suggestions for improving LMSs. Interviews were conducted in conjunction with other methods primarily to collect detailed perceptions of students and teachers regarding LMS use. Content analyses have been used to gather data regarding actual LMS use in order to help researchers discover the potential success or failure of an LMS implementation. Experiments have been conducted to measure the effectiveness of LMSs on student learning. Detailed uses of LMSs have been illustrated with case studies.

Researchers have distributed surveys that measure faculty perceptions toward LMS use. These perceptions led to recommendations for improving LMS implementations, including providing appropriate training, improving infrastructure, and ensuring availability of technical support. Hussein (2011) used three different scale axes to measure faculty attitudes toward LMS

use which focused on their personal view toward an LMS, need to use an LMS, and need for training on using the LMS. Looking at viewpoints from these different perspectives allowed Hussein (2011) to spot weaknesses in the LMS being studied in addition to discovering the attitudes of the faculty members. Nanayakkara's (2007) survey of faculty attitudes toward LMS use also contained three parts. First, demographic data was collected along with data regarding computer literacy, LMS training, and teaching style. Next, factors for LMS adoption were investigated, including both individual and organizational perceptions. Finally, the participants were requested to select the five most critical factors for system adoption and rank them in order of significance. Pynoo et al. (2011), on the other hand, used a single questionnaire to measure faculty perceptions of LMS use. They distributed the questionnaire three times during the same school year to see how teachers' perceptions of LMS use evolved throughout that year. Embi, Hamat, and Sulaiman (2012) used five questions from a larger study they conducted on e-learning in Malaysian higher education institutions. The answers to those questions revealed what faculty members are using for instruction in Malaysia and reasons why certain instructors do not use an LMS.

For over 20 years, PU and PEOU have been measured in surveys in order to determine whether they truly lead to acceptance of instructional technology. Davis (1989) pioneered this effort by developing two 14-question scales for PU and PEOU within the context of evaluating an e-mail system. These scales were parts of the foundation for a series of scales developed by Venkatesh, Morris, Davis, and Davis (2003). Six items from each of the original PU and PEOU measurement scales (Davis, 1989) were selected for use in Venkatesh et al.'s (2003) scales. The PU items Venkatesh et al. (2003) adopted focused on three main categories from Davis's (1989) work: job effectiveness, productivity and time savings, and importance of the system to one's

job. Likewise, the PEOU items were selected from the three major categories Davis (1989) defined in his scale: physical effort, mental effort, and perceptions of how easy the system is to learn.

The early work of PU and PEOU measurement has been duplicated and determined to be reliable. The Venkatesh et al. (2003) PU and PEOU scales were included as research instruments in De Smet et al.'s (2012) study of secondary teacher LMS use in Belgium to see if PU and PEOU positively affected informational use of an LMS. In this study, the PU and PEOU scales registered Chronbach's alpha values of .90 and .88, respectively (De Smet et al., 2012). Portions of Davis's (1989) work were also used by Lee and Lee (2008) in their research of an e-Learning system. In this instance, Lee and Lee (2008) were looking to see if PU and PEOU increased the learner's satisfaction of the LMS. The Chronbach's alpha values in their study were .90 for PU and .92 for PEOU (Lee & Lee, 2008). Davis's (1989) scale was also a contributor to the work of Hu et al. (2003), who used selected PU and PEOU measurement items to test whether these factors had a positive effect on a teacher's acceptance to use PowerPoint in the classroom. In this study, the Chronbach's alpha values were .77 for PU and .82 for PEOU (Hu et al., 2003).

PU and PEOU, along with other LMS use factors, can also be measured from the student perspective using surveys in order to find ways to improve LMS use at academic institutions. Students at Arab Open University in Kuwait answered questions regarding their experiences with using the school's LMS during a three-year period (Alfadly, 2013). The results led to recommendations from Alfadly (2013) to provide appropriate student orientation of e-learning that focuses not only on the technology itself, but also on making students aware of how adults learn and, in particular, how students can use the LMS to meet their own personal learning needs. Meanwhile, Green, Inan, and Denton (2012) sent a survey to students who participated in a

course created on the Blackboard LMS. This survey focused on evaluating learner satisfaction and factors such as prior experience, frequency of use, delivery format, and usability that may affect the students' learning experiences (Green et al., 2012). Little-Wiles and Naimi (2011) went in a different direction, questioning students on how their instructors were using Blackboard in their technology courses. This survey revealed that students wanted a consistent policy where all instructors used Blackboard in their courses instead of allowing some instructors to use other websites if they chose to. It was also recommended that the LMS should be reliable, easy to navigate, and contain the essential tools that students need to support the courses they are taking (Little-Wiles & Naimi, 2011).

Interviews have been conducted in previous studies to uncover reasons for certain attitudes toward using LMSs, but never as the sole methodology. Ryan, Toye, Charron, and Park (2012) interviewed an institution's technology staff regarding changes in its LMS in conjunction with surveying the instructors. Where precluding surveys in this study dealt with the faculty's actual use of the LMS, the interviews focused on the technology team's management of the LMS implementation, problems encountered, and lessons learned (Ryan et al., 2012). Wen-Kai et al. (2010) conducted interviews with seven teachers and seven students that focused on their attitude toward course management systems. These interviews, which also followed surveys of larger groups, focused on four major themes regarding LMSs: attitudes, teaching and learning approaches, perceived strengths and weaknesses, and suggestions for use. Kirby et al. (2010) used interviews to produce detailed accounts of students' perspectives regarding their transition from high school distance learning a year after leaving high school. Nasser et al. (2011) also interviewed high school students, but their purpose was gather data related to the students' experiences with and attitudes toward using an LMS. Again, surveys of larger samples were used

in these two studies to provide a foundation for selecting the questions and participants for the interviews (Kirby et al., 2010; Nasser et al., 2011).

Researchers in selected studies have used content analyses to obtain quantitative data that reflects the actual use of an LMS, which could help determine whether an LMS implementation has been successful. To measure the growth of the LMS at Tel-Aviv University, Soffer et al. (2010) counted the number of courses, faculty, and students using the LMS for each semester and each year. They performed this analysis over an eight-year span to see if the adoption of the LMS at this institution followed the Diffusion of Innovations Theory. Blau and Hameiri (2010) analyzed all teacher activities on LMSs at 10 Israeli secondary schools during a three-year period. These activities were categorized in three groups: number of logins, daily data concerning lesson topics entered, and messages sent to colleagues. Blau and Hameiri (2010) wanted to examine these different forms of online interactions during the implementation of the LMS in these schools.

Although teachers may embrace LMS use in their classes, the LMS will not contribute to student learning if students do not access it. Content analyses of student LMS use have been performed to test this reasoning. Malm and DeFranco (2012) derived a measure of LMS adoption called Average Logins Per Students (ALPS), based on system login information and student enrollment. ALPS allows researchers to see if students are utilizing the LMS. The data provided by ALPS can be broken down by section, discipline, or instructor depending on the study. Hashim, Hashim, and Esa (2011) focused on student interactions in their LMS study. They did not use ALPS, but instead used a Pearson Crosstab to explain correlations between activeness of LMS interactions and student grades. Student online behavior was also evaluated by El Haddioui and Khaldi (2012) in their study of the Manhali LMS. In this study, seven key

indicators were chosen by the researchers to analyze: total time spent logged in, number of connections, page visits, self-evaluation attempts, completed homework assignments, course and article comments, and messages. This data allowed El Haddioui and Khaldi (2012) to detect learning styles of the students and group them accordingly.

Experiments can be used to determine if an LMS is actually contributing to student learning by revealing whether using the LMS is improving student performance. In one study, students at the University of Belgrade were required to complete activities in a one-week introductory Moodle course. This course was set up like a normal Moodle course for this institution; where students needed to pass a test in order to complete it. This test was designed to assess knowledge acquired from different Moodle and traditional learning activities. As a result, adapted courses were created on that system based on the students' experience with the introductory course (Despotović-Zrakić, Marković, Bogdanović, Barać, & Krčo, 2012). Tosun and Taşkesenligil (2011) studied the students and instructors of a single chemistry course at a Turkish university in order to see if using Moodle helped the lessons to have positive effects on the students. Kay (2011) used a pre- and post-test in his study to determine changes in student performance after using web-based learning tools. In this study, students would take the pre-test at the beginning of a unit, and then use a web-based learning tool during the unit before taking the post-test at the end of the unit. The pre- and post-test scores were compared to determine changes in student performance on remembering, understanding, application, and analysis.

Case studies have revealed how LMSs are used and evaluated by detailing the users' experiences. A process-based LMS implemented in a Taiwanese secondary school was studied for 30 days (Lee et al., 2010). The researchers began this study by introducing the system to the participants. During the study period, the participants wrote reports about their experiences with

the system. Activity on the system was logged and observed by the researchers. At the end of the study period, the participants were surveyed and interviewed regarding their thoughts and comments about the LMS. A number of benefits and deficiencies of this LMS were revealed during this process (Lee et al., 2010). The implementation of a virtual high school in the United States was evaluated using observations, content analyses, and interviews with faculty and administrators (Reid et al., 2009). As a result, policies were changed or created and measurable objectives were established to ensure that the quality of the virtual high school would increase during the second year (Reid et al., 2009). In Greece, Papastergiou (2007) used a survey, online discussion transcripts, and teacher notes to find out perceptions of students and teachers regarding use of a course management system in a college-level computer science education course. His goal for this study was to investigate an LMS's strengths and weaknesses when used within a blended mode course. He also wanted to find the challenges faced by the students and instructor regarding LMS use. Mutanyatta (2008) analyzed enrollment trends from 1972 to 2002 and interviewed staff in order to discover factors that affected trends in distance education, including the use of LMSs. His results were limited, however, because he was unable to secure data regarding the effectiveness of distance education programs. In Singapore, Tay et al. (2011) used a combination of interviews, surveys, and content analyses to examine how Moodle, blogs, and wikis were used by three elementary teachers and their third-grade students. The teachers composed reports based on their experiences with the online tools and participated in interviews with the researchers. Meanwhile, the researchers also analyzed the students' activities in the online tools and distributed a survey to the students.

Use and Perceptions of Learning Management Systems in Education

The contribution of an LMS toward teaching and learning at a school varies depending on the teachers' and students' rates of adoption and methods for using the system. High school and college instructors have used LMSs to make their instruction and students' learning more efficient. LMSs have also been used as student management and communication tools. Sometimes an LMS implementation consists of a series of phases that help ensure a successful transition. LMS implementations were received well at some institutions, but teachers at other schools were hesitant to participate. Likewise, students in selected schools welcomed the opportunity to use LMSs. However, other students expressed reservations. Like any other educational technology tool, the success or failure of an LMS depends on acceptance from not only the faculty, but also the students. Additional factors outside of teacher or student control also play a part in the ultimate success of an LMS implementation.

Secondary schools and higher education institutions attempt to make teacher instruction and student learning more efficient by using LMSs. The Smartschool LMS was used by one Belgian secondary school as a digital learning environment and content administration system (Pynoo et al., 2011). Teachers at this school created exercises and tests, as well as set up learning paths for their students (Pynoo et al., 2011). Likewise, the Claroline LMS was used in a single course at a Greek university as an instructional support tool (Papastergiou, 2007). The instructor enabled many components found in an LMS, including a document repository, calendar, announcement section, discussion board, and workgroups for student collaboration (Papastergiou, 2007). LMSs are mostly used in Malaysian colleges as a method for delivering supplementary course materials which were not integrated as important components in the curriculum (Hashim et al., 2011). In these schools, LMS use was not required, but available for

the instructors and students to exchange information (Hashim et al., 2011). At a military academy in South Africa, the survey tool in Moodle was used in a study of a Computer Information Systems class for feedback or quick reference to determine problem areas, while WebCT was utilized for conventional e-learning activities such as assessments, class resources, discussion forums, and e-mail (Pretorius, 2010). Two separate LMSs were used in this study because WebCT was the official LMS of this academy, but it lacked the survey tool needed for the pre- and post-course survey portions of the study (Pretorius, 2010).

Instructors have also used LMSs for communication and student management, replacing e-mail communication and report cards in some cases. Secondary teachers in Belgium were able to communicate with their colleagues, students, and superiors by using Smartschool's internal messaging system and discussion forums (Pynoo et al., 2011). An "intradesk" was also utilized for sending and receiving documents between users (Pynoo et al., 2011). Teachers in Israeli secondary schools use the Mashov LMS to interact online with students, parents, and other teachers (Blau & Hameiri, 2010). Interactions in Mashov occurred in two ways: Teachers entering daily data regarding lesson topics, materials, homework, student attendance, and grades and two-way interactions among teachers, students, and parents (Blau & Hameiri, 2010). The JUSUR LMS provided universities in Saudi Arabia with registration, scheduling, delivering, tracking, communication, and testing tools, along with a set of teaching and learning management processes (Hussein, 2011).

At times, LMSs are implemented in multiple phases. Conducting a pilot phase helps institutions identify and resolve technical and logistical issues of the LMS, therefore increasing the chances of a successful implementation. At a vocational school in Macedonia, one teacher used Moodle his own classes during the 2011-12 school year (Acevski et al., 2012). After that

phase was considered to be generally successful, Moodle was implemented for the remaining teachers and students in the school (Acevski et al., 2012). In Indonesia, Linawati, Sukadarmika, & Sasmita (2012) recommended that a preparation stage be executed first when applying an LMS across an institution, making sure hardware, software, and plug-ins are installed and working before going into the development stage where two-way sync interface is established. Doing this enabled one university to establish synchronization between Moodle and Wordpress so teachers could include blogs as part of their courses (Linawati et al., 2012). In Taiwan, the MyNote LMS was developed as a prototype given to 50 students who were required to practice using it as part of a study before it went into the production stage (Chen et al., 2012). After testing MyNote, these students completed a questionnaire regarding their experiences, where the results influenced changes in design of the system and user training (Chen et al., 2012). Also, a process-based knowledge management system was implemented in a secondary school in order to introduce knowledge relevant to Internet information technology (Lee et al., 2010). After 30 days of use, 31 faculty members completed surveys and interviews, where they revealed benefits and insufficiencies of the system, suggesting what changes should be made to the next version of this system (Lee et al., 2010). A university in Australia established a change management program based on self-determination theory to support a campus-wide LMS switch from Blackboard to Moodle (McNeil, Arthur, Breyer, Huber, & Parker, 2012). This migration was executed using a multi-faceted approach, including a pilot period, initial training, and support personnel for the faculty (McNeil et al., 2012).

In general, teachers have a positive attitude toward the use of LMSs, but admit weaknesses are present. Teachers at one Midwestern university stated that LMS use improves teaching and learning (Lonn & Teasley, 2009). However, instructors in New Zealand did not

universally believe that they would adopt an LMS even if they believed that it would improve their teaching (Nanayakkara, 2007). Teachers felt that LMSs are easy to learn and use (Papastergiou, 2007), but sometimes successful implementation of an LMS doesn't always come naturally (Wen-Kai et al., 2010). Obstacles such as inferior infrastructure, lack of technical support, and resistance to change interferes with the implementation process (Hussein, 2011). Hurd (2009) found that teachers who had positive attitudes toward computers used them more often. However, there have been instances where social influence by superiors drove the acceptance of an LMS by teachers more than a positive attitude (Pynoo et al., 2011).

Several factors, including competency, PU, and PEOU, are usually taken into consideration before teachers begin using LMSs. Attitude toward use and competence levels of the faculty play a role in this decision (Asiri, Mahmud, Bakar, & Ayub, 2012). The PU and PEOU of the teachers are also investigated (Nanayakkara, 2007). According to De Smet et al. (2012), PU and PEOU have a strong effect on LMS use in education. However, Venter et al. (2012) found that the statistical relationship between PU and PEOU and usage behavior is not strong. Teachers at an elementary school in Singapore pointed out that seamless LMS use depended on the efficiency of the Internet bandwidth that was provided (Tay et al., 2013). At one particular university in California, a faculty member's decision to adopt an LMS was not by age or gender, but by tenure status, LMS experience, and computer experience (Gautreau, 2011).

Students in selected studies also felt that LMSs were helpful in course instruction and were willing to use them during these studies and in future courses. They acknowledged the usefulness of LMSs in terms of improved communication and sharing of content with their instructors and with each other (Papastergiou, 2007). In addition, most students felt that access to course materials, grades, and assignments in an LMS made it easier for them to track their

progress (Little-Wiles & Naimi, 2011). Acevski et al. (2012) found that students using an LMS in one Macedonian vocational school were more motivated and interested in learning and they hoped more of their teachers would begin to use the LMS. Tay et al. (2011) also found that the students in their study were more motivated and engaged using an LMS.

Not all students view the LMS as an effective learning helper and motivator. Lonn and Teasley (2009) discovered that students in their study thought the LMS was efficient in managing communication and content for their courses, but they did not necessarily think the LMSs actually improved the faculty's instruction. This perception could be seen in one Malaysian college, where there was no significant correlation between activeness of LMS interaction and a student's grade (Hashim et al., 2011). Even students at one Greek institution who thought LMSs were useful have expressed that they still need to be improved in terms of user-friendliness, stability, and reliability (Papastergiou, 2007).

Student involvement is a major key to the successful implementation of an LMS. If students are not actively participating in an LMS, it becomes difficult for teachers to justify using it. Teachers who used an LMS to interact with students logged into the LMS more often than teachers who used it to interact with staff only (Blau & Hameiri, 2010). In addition, students were motivated to use an LMS when teachers built activities in their lessons with benefits and rewards (Nasser et al., 2011). Tosun and Taşkesenligil (2011) found that using Moodle to present lesson materials from different aspects (text page, web page, links to other pages, links to files) and provide interactive lesson activities ensured that the lessons were enjoyable and provided students with richer content.

An LMS implementation can fail based on factors dealing with user competency, but sometimes it can fail due to circumstances beyond the users' control. Lack of training and lack of

time are two main reasons stated by instructors regarding why they do not adopt LMSs (Embi et al., 2012). Improper deployment of infrastructure and equipment also play a part in this resistance (Al-alak & Alnawas, 2011). From the student perspective, it was found that rural secondary school students in Malaysia have moderate technology skills and a moderate attitude toward computer technology which is influenced by economic and geographical factors (Judi, Amin, Zin, & Laith, 2011). Other reasons why LMSs fail include high costs, poor decisions, competition, and the absence of appropriate business strategies (Alfadly, 2013).

CHAPTER 3

PROCEDURES

Mixed-Methods Research Paradigm

According to Johnson and Onwuegbuzie (2004), the mixed-methods paradigm is a pragmatic approach, combining the strengths of both qualitative and quantitative research techniques into a single study. It is an approach in which researchers can answer a broader and more complete range of research questions because they are not confined to a single method (Johnson & Onwuegbuzie, 2004). The mixed-methods paradigm assumes that collecting diverse types of data provides the best understanding of a research problem (Creswell, 2009). Although considerable time, resources, and a thorough understanding of both qualitative and quantitative methods are necessary to effectively conduct this type of study, mixed methods can be used to build on the findings of a quantitative study by continuing the research qualitatively or vice versa (Gay, Mills, & Airasian, 2006).

Creswell (2009) mentioned that a mixed-methods study can include deductive logic or inductive logic, depending on the theoretical framework of the study. This particular study was conducted inductively, moving from generalizations revealed from an introductory survey to themes after an interview process. The participants were asked to talk about their experiences of using Moodle. One goal of this research study was to discover why teachers view their experience of Moodle in a particular way. Themes were revealed based on the data collected from the interviews.

Contrary to a strictly quantitative or strictly qualitative study, a mixed method study can provide stronger evidence for a conclusion through convergence of findings (Johnson & Onwuegbuzie, 2004). In addition, using mixed methods can add insights to a study that might be

missed when only a single method is employed (Johnson & Onwuegbuzie, 2004). For example, a researcher can first conduct a broad survey in order to generalize results to a population, then focus on open-ended interviews to collect detailed views from participants that may not be present in the survey results (Creswell, 2009).

Rationale for Mixed-Methods Design

Mixed-methods research is appropriate for this study because, according to Creswell (2008), using only one type of research would not be enough to address the research problem outlined in Chapter 1. Quantitative studies are designed to test theories by specifying hypotheses and collecting data to either support or discredit the hypothesis (Creswell, 2009). In these studies, findings are presented numerically or graphically (Buddenbaum & Novak, 2001). The hypotheses mentioned in Chapter 1 provided the researcher with a general idea of which factors influence some teachers to use Moodle more than others. However, four research questions mentioned in Chapter 1 required more detailed information regarding the teachers' use of Moodle in the classroom. Therefore, based on Creswell's (2009) definition of mixed-methods research, collaboration with teachers was imperative for this study. Using a qualitative method allowed the researcher to do this in order to collect the detailed information that is needed to answer the research questions.

Creswell (2009) stated that qualitative studies are designed to explore and understand the meaning individuals or groups ascribe to a problem. In this type of a study, findings are presented in a narrative form (Buddenbaum & Novak, 2001). A researcher who conducts a qualitative study focuses on a single concept or phenomenon and studies the context or setting of the participants (Creswell, 2009). For part of this study, the researcher focused on the teachers' use of Moodle in their classes and attempted to discover why some teachers use Moodle on a

regular basis while other teachers barely use Moodle at all. This led him to present a portion of his findings in a narrative form because the intent was to identify and explain the factors that cause differences in the teachers' levels of Moodle use.

Rationale for Explanatory Design

Creswell (2008) listed four common types of mixed methods research: explanatory, exploratory, triangulation, and embedded. The explanatory design places a priority on quantitative data, which are collected first in the study, while the qualitative data is used to refine the quantitative results (Creswell, 2008). Conversely, in the exploratory design, the qualitative data is collected first and prioritized in order to identify concepts and possible hypotheses before the quantitative data are collected (Gay et al., 2006). In the triangulation method, both qualitative and quantitative data are collected at the same time and equally weighted throughout the study (Creswell, 2008). Gay et al. (2006) claim that one method could be dominant in a triangulation design, but Creswell (2008) disagrees. He refers to this scenario as an embedded design because although the two methods are collected simultaneously, the method that is not considered dominant ends up being embedded in the study, providing support to the data that has higher priority.

This study was conducted using an explanatory design. This design was appropriate because the quantitative data took priority. The purpose of this study was to discover factors that contribute to teacher use and administrator support of IU8's Moodle LMS. The common factors that affect technology use were easily measured with quantitative methods. The findings derived from these methods not only tested the hypotheses listed in Chapter 1, but, as Gay et al. (2006) described, they also enabled the researcher to determine what data to collect during the qualitative phase that helped explain the quantitative results. In addition, it was possible that a

portion of the results could reveal a trend that was unexpected and therefore explained with qualitative data, similar to what happened in a study conducted by Ivankova, Creswell, and Stick (2006).

Study Population

The population for this study consisted of teachers and administrators in three IU8 school districts that have subscriptions to use IU8's Moodle LMS. Three of the four counties within the IU8 service area were represented in this study. For confidentiality purposes, these school districts are identified in this study as District A, District B, and District C.

District A is a rural school district located in Bedford County, Pennsylvania. This school district consists of two elementary schools that service 665 students (Grades Pre-K-6) and one middle/high school that services 653 students (Grades 7-12), for a total student enrollment of 1,318. Eighty-four teachers are employed by District A, along with nine administrators.

District B is a rural school district located in Somerset County, Pennsylvania. One elementary school is located in this school district that services 385 students (Grades K-5). This school district also features one middle school servicing 216 students (Grades 6-8) and one high school servicing 267 students (Grades 9-12). A total of 868 students attend a school located in District B. This school district employs 75 teachers and seven administrators.

District C is a rural school district located in Cambria County, Pennsylvania. This school district contains three elementary buildings that service 671 students (Grades Pre-K-4). In addition, 535 students (Grades 5-8) are serviced by one middle school and another 519 students (Grades 9-12) attend one high school. The total student enrollment for this school district is 1,725. District C employs 122 teachers and eight administrators.

Contacting School Districts for Permission

The researcher currently serves as Technology Services Administrator for IU8. As a result, he has a professional relationship with the superintendents of the three school districts selected for this study. Before obtaining IRB approval, the researcher requested permission from these superintendents and, if it was deemed necessary, their respective school boards to conduct this study in their school districts. This request consisted of a formal letter (see Appendix A) that explained the purpose of this study, the data collection procedures, and the steps that were taken to maintain confidentiality. The superintendents were encouraged to respond with letters stating whether permission to include their school districts in the study were granted.

Data Collection

Surveys

The first phase of the data collection consisted of an online survey (see Appendix B) that all teachers employed by the participating school districts were encouraged to complete. Gay et al. (2006) stated that an online survey provides the quickest and most efficient way to collect quantitative data. Berger (2000) explained that survey data can be summarized in a way where it can be quickly seen what the data reveal about the study population. In the case of this study, the survey data helped the researcher quickly identify the factors that contribute to teachers' use of Moodle. Also, Creswell (2008) pointed out that survey results help determine subject selection and data collection for the qualitative phase of a mixed-methods study.

This survey was administered using Qualtrics online software, which is available for free to all Indiana University of Pennsylvania doctoral candidates. In order to ensure that all teachers received access to the survey, the researcher sent an e-mail (see appendix C) to the superintendents and requested that they forward the e-mail to all teachers who work in their

buildings. This e-mail contained a direct link to the survey as well as the deadline date for when the survey needed to be completed. Within the e-mail, the researcher included an incentive for completing the survey in the form of an entry for a cash gift card drawing. Singer and Ye (2013) have concluded that incentives increase response rates to all types of surveys. Due to this incentive, respondent and school names were collected as part of the data. A setting was applied on the survey to ensure that each teacher was able to submit only one response. Also, a disclaimer was included on the survey stating that all names submitted would remain confidential.

After the survey e-mail announcement was sent, the teachers had two weeks to complete the survey. A reminder e-mail was sent to the superintendents one week after the original announcement was distributed. Again, the superintendents forwarded the message to their teachers. After the second week had concluded, the survey was closed and data analysis commenced. Also, the researcher randomly selected two names from each participating school district as winners of the cash gift card drawing and distributed the prizes to the respective schools.

The survey itself consisted of three multiple choice questions and 11 Likert-scale items. The questions in the survey were designed to help the researcher answer the quantitative and mixed-method research questions (RQ_1, RQ_2, RQ_3, and RQ_4) mentioned in Chapter 1. The first question of the survey asked whether the teacher used Moodle. The teachers' use of Moodle served as the dependent variable for the hypotheses listed in chapter 1. Question number two addressed RQ_1 and H_1 by asking the respondents to explain why they think their school districts initiated a subscription to IU8's Moodle service. As mentioned in Chapter 1, school districts implement LMSs for a variety of reasons, including making them part of a hybrid program,

offering extra courses to students that were not previously available, or helping to establish a school district cyberschool program (Reid et al., 2009). These three reasons were listed as choices for this question, along with an open-ended fourth choice in case teachers indicated other reasons why their school districts decided to implement Moodle. The third question was a 5-point Likert-scale item designated to measure the teachers' perception on how successful their school districts have been in regards to meeting their goals for using Moodle. The data collected with this question enabled the researcher to test H_2, which further addressed RQ_1. Question number four addressed RQ_2 and H_5 by requiring participants to designate who encouraged them to use Moodle. The remainder of the survey contained 5-point Likert-scale questions based on the PU and PEOU scales designed by Davis (1989), which addressed RQ_1, H_3, and H_4. These scales have been used in previous LMS studies with Chronbach alpha scores ranging from .88 to .92, therefore they were considered reliable for this study (Lee & Lee, 2008; De Smet et al., 2012).

Interviews

The second phase of the data collection included interviews conducted with 15 participating teachers. The information gathered in these interviews helped the researcher answer the mixed-method research questions (RQ_3 and RQ_4) mentioned in Chapter 1. Parlett and Hamilton (2010) explained how interviews enable researchers to ask subjects about their experiences and opinions. In this particular study, the interviews enabled the researcher to ask the teachers about their experience with Moodle, what they thought of it, how it compared to other teaching methods they employ, and their opinions on the value of this innovation. Five teachers from each school district were selected using a purposive sampling method. Parlett and Hamilton (2010) suggested that interview subjects should have special insight or involvement with

technology that make their viewpoints noteworthy for this study. The researcher followed this recommendation by referring to the survey data and consulting with the school district superintendents and building principals in order to select teachers to interview. The purposive method was appropriate for this study because, according to Creswell (2009), the individuals who were selected for interviews best helped answer the research questions stated in Chapter 1. In addition, Buddenbaum and Novak (2001) deemed the purposive sampling method appropriate for in-depth interviews.

The researcher conducted semi-structured interviews with the subjects in order to obtain teachers' thoughts regarding the use of Moodle in their classroom. He had a standard list of questions to ask each teacher (see Appendix D), but had the discretion to ask unscripted questions in order to follow up on a subject's response and maintain a casual quality that Berger (2000) claims is normally observed in an unstructured interview. Interviews were appropriate for this study because, as Berger (2000) insinuated, they were able to provide information regarding the thoughts and beliefs of the teachers regarding Moodle use that could not be obtained any other way.

In addition, the researcher conducted nine semi-structured interviews with selected administrative personnel (three at each school district). These subjects included, but were not limited to, superintendents, building principals, and educational technology specialists. The information gathered in these interviews helped the researcher answer the qualitative research questions (RQ_5 and RQ_6) mentioned in Chapter 1. As with the teacher interviews, he used a purposive sampling method to ensure Creswell's (2009) justification that the selected individuals were most likely to help answer the research questions for this study. There was a separate list of questions for the administrators (see Appendix E) that focused on the school districts' goals for

the use of technology in education and how Moodle was helping to meet those goals. However, the researcher followed Berger's (2000) suggestion to ask unscripted follow-up questions during the interviews to clarify answers and maintain an informal nature.

Data Analysis

Surveys

After the initial survey responses were collected in Qualtrics, SPSS was used to evaluate the data. Nominal variables included in this data analysis were the teacher's use of Moodle, opinion on why the school district is subscribing to Moodle, opinion on school district success, and designation of who encouraged teacher to use Moodle. Ratio variables included in this analysis were PU and PEOU.

For the first three hypotheses, three one-sample chi-square tests were conducted using the nominal variables. In these tests, the teacher's use of Moodle was compared to the teacher's opinion on why the school district is subscribing to Moodle (for H_1), opinion on school district success of Moodle (for H_2), and designation of who encouraged the use of Moodle (for H_5). After chi-square values were established, contingency coefficients were calculated in order to determine whether correlations existed for H_1, H_2, and H_5. Blaikie's (2003) convention was used to identify strong coefficients for these hypotheses. This convention suggests that any contingency coefficient greater than .59 is considered to be strong (Blaikie, 2003). According to Reinard's (2006) criteria for selecting statistical tests, Chi-square tests were appropriate for these three hypotheses because the data being collected for them were nominal. Using the same criteria (Reinard, 2006), the contingency coefficient was the proper correlation method for these three hypotheses because for each test, there were two or more categories for each variable.

For H_3 and H_4, the point biserial correlation was computed and interpreted using Reinard's (2006) table for minimum correlations for significance. In these tests, the teacher's use of Moodle was compared to PU (for H_3) and PEOU (for H_4). The point biserial correlation is normally used when one variable is nominal and the other variable is either interval or ratio (Reinard, 2006). In this case, PU and PEOU were ratio variables and the teacher's use of Moodle was a nominal variable, so using the point biserial correlation was appropriate for this study.

Interviews

As recommended by Berger (2000), each interview was recorded in order to ensure that the information was accurate. Although Berger (2000) referred to cassette tapes as the media of preference, the researcher used a digital voice recorder app on an iPad to capture the interview data. Crocombe (2009) explained that using digital recording devices result in a higher quality sound, which is easier to transcribe, and automatically produce audio files that are easily transferred to a computer for playback and analysis. Mitchell, Peterson, and Kaya (2004) added that the resulting audio files could be quickly copied for backup purposes. Although the interviews were recorded, the researcher followed Creswell's (2009) suggestion to take notes on paper in case the iPad malfunctioned for any reason.

After each interview was conducted, the researcher saved a copy of the audio file to his laptop, then deleted the file from the iPad in order to preserve confidentiality and free up storage space on the iPad for the next interview. Once the files were saved to his computer, they were transcribed using a process similar to what Matheson (2007) prescribed. In her article, Matheson (2007) suggested using a digital voice editor to play back the recorded interview and a headset to listen to the playback. While listening to the interview, the researcher is advised to repeat what is heard into the headset microphone while using voice recognition software (Matheson, 2007). For

this study, the researcher used Windows Media Player to play the audio interview files and Dragon Naturally Speaking to transcribe the files to a Microsoft Word document.

Transcripts of the interviews were coded using the in vivo method, where the data were coded based on the actual language of the participants (Creswell, 2009; Saldaña, 2011). In this method, the researcher selected excerpts from the transcripts that stood out as significant (Saldaña, 2011), which helped identify the perceptions teachers had regarding the use of Moodle in the classroom. The NVivo software program was used to store and organize the qualitative data. Using NVivo made the coding process faster and more efficient (Creswell, 2009).

Integration of Quantitative and Qualitative Data

The integration of quantitative and qualitative methods took place throughout the entire study in a way similar to Ivankova et al.'s (2006) study of students' persistence in a distance learning doctoral program. First, both quantitative and qualitative research questions were introduced in Chapter 1 and used as guidelines for developing the survey and interview protocols described earlier in this chapter. After the survey data was collected and analyzed, the researcher selected subjects for the teacher interviews based on the survey results. This is typical for a sequential explanatory study, where the quantitative data is given more weight and the qualitative data is used to support the quantitative findings (Creswell, 2009). In this case, the interviews served as a qualitative follow-up analysis for the quantitative survey. In addition, although a set of guiding questions had already been established for the interviews, other questions were developed based on the survey data in order to, as Doyle, Brady, and Byrne (2009) suggested, address any outlying values that were revealed. Finally, after the data collection was complete, the results were discussed in detail by grouping the findings to the corresponding quantitative and qualitative research questions. In order for this to happen, the themes discovered in the

qualitative phase were paired with variables from the quantitative phase. These pairings established what Lieber (2009) called a "middle ground" that promoted reliability and combined analysis for the data.

Ethics

The American Educational Research Association (1992) has established a set of ethical standards designed specifically to guide the work of researchers in education. These standards suggest that the researcher should strive to maintain confidentiality, treat participants with respect, avoid deceit unless justified by the study's scientific, educational, or applied value, be clear in negotiating access, and report true results. In order to ensure an ethical study, informed consent of all participants is imperative (AERA, 1992). Therefore, in addition to obtaining IRB approval, the researcher also requested permission from the superintendents and school boards (if necessary) of each selected school district before distributing surveys or conducting interviews. In addition, all potential subjects were advised that participation in this study was voluntary and they could quit at any time (AERA, 1992). Also, all school district and teacher names were kept confidential (AERA, 1992). All data collected in this study is being kept on an encrypted USB drive for three years in a locked, fireproof safe in the researcher's home. After three years, the data will be destroyed. These steps assure confidentiality and anonymity.

CHAPTER 4

DATA ANALYSIS

Introduction

The purpose of this study was to explore the factors that influence administrators from three Pennsylvania school districts to continue purchasing subscriptions to a Moodle LMS managed by IU8 and discover teacher perceptions and other factors that affect the use of this LMS in these three school districts. Specifically, the researcher collected data based on six research questions. First, he investigated whether teachers' perceptions of LMSs affected their level of use. Next, he sought to find out if encouragements from others influenced the teachers' use of an LMS. The researcher then turned his attention to finding details about the teachers' perceptions regarding LMS use in their classes and how they are encouraged to use an LMS. Finally, the researcher completed his data collection by asking questions to find out what factors were most influential for these school districts to continue using the Moodle LMS and how this LMS is helping these school districts meet their educational technology goals.

Study Sample

The online survey described in Chapter 3 (see Appendix B) was distributed via e-mail link to 281 teachers employed by the three participating school districts on September 2, 2014. The survey was open for teachers to complete from that date until September 16, 2014. During that time period, 150 teachers completed the survey (62 from District A, 43 from District B, 45 from District C), for a response rate of 53.38%.

Fifteen teachers who responded to the survey were selected to participate in the interviews described in Chapter 3, along with nine school district administrators, for a total of 24 interview subjects. The interview participants were distributed evenly among the three school

districts (five teachers and three administrators per school district). Eight interviews were conducted at District B on October 20, 2014. One interview was conducted with a teacher from District A at the IU8 Executive Office on October 22, 2014. Five interviews were conducted at District A on October 24, 2014. Five interviews were conducted at District C on November 10, 2014. The remaining four interviews involving personnel from Districts A and C were conducted using a private, secure web-conferencing software program during the period from October 31, 2014 to November 17, 2014. This was necessary because these four participants were not available for interviews when the researcher was present at the school districts. The researcher failed to conduct one interview with a teacher from District A before the end of the data collection period. In this instance, the researcher had to reschedule the virtual interview twice due to scheduling conflicts with the subject. When the interview was finally attempted, the subject experienced difficulties with the web-conferencing system and was unable to connect for the interview. The researcher attempted to contact the subject one more time to reschedule, but did not receive a reply.

The 23 interview subjects are identified in this dissertation numerically for confidentiality purposes. Some numbers were intentionally omitted because the statements from these subjects were not included in the results.

RQ_1: How Do Teachers' Perceptions of an LMS Affect Their Levels of Use?

It was assumed in Chapter 1 that a small percentage of teachers in each school district started using Moodle when it was first launched four years ago and the number would grow, but not get to total participation based on the adoption categories that Rogers (1962) established from his Diffusion of Innovations Theory. According to the survey results, Moodle still seemed to be in the early adopter stage, with 10 teachers (16.73%) using Moodle for at least one of their

courses in District A, seven teachers (16.28%) in District B, and three teachers (6.67%) in District C. Due to the low number of teachers actually using Moodle, the researcher expected the hypotheses linked to RQ_1 (H_1, H_2, H_3, and H_4) to be supported by the survey data. Although the Technology Acceptance Model suggests that PU and PEOU have a direct effect on technology use (Davis, 1986), it was also found that PEOU was a significant antecedent of PU, rather than a direct determinant of acceptance (Lee et al., 2003). This led to the assumption in Chapter 1 that an inverse relationship existed between PU and PEOU in this study, which therefore implied that there was a high level of PU or PEOU present and another factor was contributing to the low level of Moodle use in these three school districts. The researcher combined the data from each school district to test these hypotheses. The results of these tests helped the researcher answer this quantitative research question by indicating which perceptions had a significant effect on the teachers' use of Moodle.

H_1: There is No Significant Relationship Between a Teacher's Opinion on Why the School District Subscribes to an LMS and the Teacher's Use of That LMS.

For H_1, the teachers' use of Moodle was compared with the teachers' opinion on why their school districts subscribe to IU8's Moodle service. This was done by comparing the responses from survey question 2 (Why do you think your district decided to subscribe to Moodle?) to the responses of survey question 1 (Do you currently use Moodle as a tool in any of the courses that you teach?). This comparison is illustrated in Table 1, a crosstab where the rows represent the reason the teacher thinks the school district subscribes to Moodle and the columns represent whether the teacher currently uses Moodle in the school district. The *Yes* column represents the teachers who currently use Moodle. The *No* column represents teachers who do not currently use Moodle.

Table 1

Relationship Between Moodle Use and Teacher's Opinion on Why School District Subscribes to Moodle

	Teachers Using Moodle?[a]	
Reason District Subscribes	**Yes**	**No**
Hybrid Learning Program	2	42
Offer Extra Courses	6	27
District Cyberschool Program	8	40
Other	4	21

Note. This table compares responses from survey question 2 to responses from survey question 1. The data from all three school districts were combined for this test. Contingency coefficient (C = .24) calculated using Chi-square ($\chi^2 = 4.28$) test with $p < .05$ and $df = 3$.
[a] Teachers were asked if they currently use Moodle as a tool in any course that they teach.

Blaikie (2003) has established the following criteria for strength of an association based on the contingency coefficient: .00 – None, .01 to .09 – Negligible, .10 to .29 – Weak, .30 to .59 – Moderate, .60 to .74 – Strong, .75 to .99 – Very Strong, and 1.00 – Perfect. The results from this comparison ($p < .05$, $df = 3$, $\chi^2 = 4.28$, $C = .24$) reveal the relationship between these two variables is weak according to Blaikie (2003). Therefore, H_1 is supported by this data and the researcher accepts the hypothesis.

H_2: There is No Significant Relationship Between a Teacher's Opinion on How Successful the School District Is in Meeting Its Goals for Using the LMS and the Teacher's Use of That LMS.

For H_2, the teachers' use of Moodle was compared to their opinion on how successful the school district has been with its goals for using Moodle. This was done by comparing the responses from survey question 3 (In your opinion, on a scale of 1 to 5, how successful has the district been in meeting its goal(s) for using Moodle?) to the responses from survey question 1. This comparison is illustrated in Table 2, a crosstab where the rows represent the degree of

success the school district has with achieving its goals for using Moodle as perceived by the teacher and the columns represent whether the teacher currently uses Moodle in the school district. The rows represent the Likert scale with values from 1 to 5, with 1 representing *not successful* and 5 representing *very successful*. The *Yes* column represents the teachers who currently use Moodle. The *No* column represents teachers who do not currently use Moodle.

Table 2

Relationship Between Moodle Use and Teacher's Opinion on School District Success of Moodle

	Teachers Using Moodle?[a]	
Success Rating	**Yes**	**No**
5 (Very Successful)	3	5
4	7	20
3	8	60
2	1	33
1 (Not Successful)	1	12

Note. This table compares responses from survey question 3 to responses from survey question 1. The data from all three school districts were combined for this test. Contingency coefficient (C = .02) calculated using Chi-square ($\chi^2 = 1.43$) test with $p < .05$ and $df = 4$.
[a] Teachers were asked if they currently use Moodle as a tool in any course that they teach.

Using the same requirements mentioned in the previous subsection, the results from this comparison ($p < .05$, $df = 4$, $\chi^2 = 11.43$, $C = .02$) reveal the relationship between these two variables is negligible (Blaikie, 2003). Therefore, H_2 is supported by this data and the researcher accepts the hypothesis.

H_3: There is No Significant Relationship Between a Teacher's Perceived Usefulness of an LMS and the Teacher's Use of That LMS.

For H_3, the teachers' use of Moodle was compared to their PU by calculating point biserial correlations for all PU scale items in the survey. This was done by comparing the responses to survey questions 5a to 5e (PU scale items) to the responses to survey question 1. These correlations are illustrated in Table 3.

Table 3

Correlation Between Moodle Use and Perceived Usefulness

PU Scale Item	**r_{pbis} with Moodle Use**
Improves job performance	.237**
Accomplish tasks more quickly	.232**
Improves quality of work	.246**
Makes it easier to do job	.189*
Find Moodle to be useful in job	.327**

Note. This table displays the point biserial correlation between survey questions 5a to 5e and survey question 1. The data from all three school districts were combined for this test. PU = perceived usefulness. Survey questions 5a to 5e adapted from "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," by F. D. Davis, 1989, *MIS Quarterly, 13*(3), p. 324.
* $p < .05$. ** $p < .01$.

With a sample size of 150, the minimum value needed for a significant correlation is .160 at $p < .05$ and .210 at $p < .01$ (Reinard, 2006). As shown in Table 3, all of the point biserial correlations are above the minimum requirement for significance at $p < .05$ and all but one are above the minimum requirement for significance at $p < .01$. Therefore, all PU scale items in the survey have a significant correlation with the teachers' use of Moodle, which does not support H_3, so the researcher rejects the hypothesis.

H_4: There is No Significant Relationship Between a Teacher's Perceived Ease of Use of an LMS and the Teacher's Use of That LMS.

For H_4, the teachers' use of Moodle was compared to their PEOU using point biserial correlations for all PEOU scale items in the survey. This was done by comparing the responses to survey questions 5f to 5j (PEOU scale items) to the responses to survey question 1. These correlations are illustrated in Table 4.

Table 4

Correlation Between Moodle Use and Perceived Ease of Use

PEOU Scale Item	**r_{pbis} with Moodle Use**
Learning to use Moodle is easy	.308**
It is easy to become skillful	.282**
Flexible to interact with	.219**
Easy to get Moodle to do what I want	.258**
I find Moodle easy to use	.285**

Note. This table displays the point biserial correlation between survey questions 5f to 5j and survey question 1. The data from all three school districts were combined for this test. PEOU = perceived ease of use. Survey questions 5f to 5j adapted from "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," by F. D. Davis, 1989, *MIS Quarterly, 13*(3), p. 324.
** $p < .01$.

As shown in Table 4 and using the same requirements mentioned in the previous subsection, all of the point biserial correlations are above the minimum requirement for significance at $p < .01$. Therefore, all PEOU scale items in the survey have a significant correlation with the teachers' use of Moodle, which does not support H_4, so the researcher rejects the hypothesis.

According to the hypothesis test results, teachers who find an LMS to be useful are more likely to use an LMS for their courses. Likewise, teachers who perceive that LMSs are easy to use tend to use them more often than teachers who do not perceive that they are easy to use. On the other hand, a teacher's opinion on why a school district subscribes to an LMS or how successful a school district is in meeting its goals for using an LMS has no effect on that teacher's level of LMS use.

It must be noted that the low levels of Moodle use in this study could also come from teachers' opinions about technology as a whole, based on comments from this school district administrator:

> Some of them are interested in using [Moodle] and they find it to be very helpful and then other teachers, not so much. So, it seems to me it's a matter of the teachers who are more comfortable with technology and it's not necessarily because it's Moodle. It's just because it's technology in general. (Interview 14, personal communication, October 24, 2014)

Another school district administrator added, "I think that the teachers that enjoy using technology have embraced it. They saw it as just what it is, a tool. It's an additional tool or resource" (Interview 5, personal communication, October 20, 2014).

RQ_2: Do Encouragements from Others Affect the Teachers' Level of Use of the LMS?

To answer this quantitative research question, H_5 was tested by comparing the teachers' use of Moodle to their designation of who encouraged the use of Moodle. As mentioned earlier, the low number of survey respondents who indicated that they use Moodle led the researcher to believe that H_5, the hypothesis linked to this research question, would be supported by the survey data. The researcher combined the data from each school district to test this hypothesis. The results from this test helped the researcher answer this question by indicating whether encouragement played a significant role in the use of Moodle by the study sample.

H_5: There is No Significant Relationship Between How a Teacher is Encouraged to Use an LMS and the Teacher's Use of That LMS.

This comparison between teacher use of Moodle and encouragement is illustrated in Table 5, a crosstab where the rows represent who encourages the teacher to use Moodle and the columns represent whether the teacher currently uses Moodle in the school district. This was done by comparing the responses from survey question 4 (Who has been encouraging you to use Moodle in your district?) to the responses from survey question 1. The *Yes* column represents the

teachers who currently use Moodle. The *No* column represents teachers who do not currently use Moodle.

Table 5

Relationship Between Moodle Use and Encouragement of Moodle Use

	Teachers Using Moodle?[a]	
Encourager	**Yes**	**No**
Another teacher	2	9
Building principal	2	5
Student demand	0	1
No one	5	78
District administration[b]	7	22
Other	4	15

Note. This table compares responses from survey question 4 to responses from survey question 1. The data from all three school districts were combined for this test. Contingency coefficient (C = .09) calculated using Chi-square ($\chi^2 = 9.53$) test with $p < .05$ and $df = 5$.
[a] Teachers were asked if they currently use Moodle as a tool in any course that they teach.
[b] Includes superintendent, curriculum coordinator/director, and federal programs director.

Using the same requirements mentioned in the test for H_1 (see page 43), the results from this comparison ($p < .05$, $df = 5$, $\chi^2 = 9.53$, $C = .09$) reveal the relationship between these two variables is negligible (Blaikie, 2003). Therefore, H_5 is supported by this data and the researcher accepts the hypothesis. This was reinforced in an interview with an administrator from District C, who stated that the school district scheduled after-school workshops designed to help the teachers with Moodle and get them interested in the LMS, but the workshops were poorly attended (Interview 15, personal communication, October 31, 2014). Therefore, based on these findings, a teacher's level of LMS use is not affected by encouragement from others.

RQ_3: What Are the Perceptions of Teachers in Three IU8 School Districts Regarding Use of an LMS in Their Classes?

To answer this mixed-method research question, the subjects were asked questions regarding the following: (a) their opinions of why the school districts decided to use Moodle, (b)

how successful they think the school districts are with meeting their goals for using Moodle, (c) their perceived usefulness of Moodle, and (d) their perceived ease of use of Moodle. Using the mixed-methods approach enabled the researcher to discover unique perceptions on LMS use from each participating school district.

Reasons School Districts Subscribe to an LMS

In the survey, the teachers were first asked why they thought their school districts subscribed to IU8's Moodle service. They could select that their school district subscribed to Moodle because it wanted to (a) incorporate it as part of a hybrid learning program, (b) offer extra courses to students that were not previously available, or (c) incorporate it as part of a school district cyberschool program. A fourth choice was available for the teachers to select if they believed their school district used Moodle for another reason, which they were able to specify. The results, which are displayed in Table 6, differed based on the school district. In Table 6, a frequency distribution is included for each school district and the entire sample.

Table 6

Why Do You Think Your District Decided to Subscribe to Moodle?

Reason	**District A**	**District B**	**District C**	**Total**
District Cyberschool Program	37	3	8	48
Incorporate Hybrid Learning	13	14	17	44
Offer Extra Courses	7	22	4	33
Don't use it	0	0	3	3
All of the above	2	0	0	2
Communication/survey tool	0	0	2	2
Less expensive	0	0	2	2
Not sure	0	0	2	2
Professional Development	0	0	2	2
Provide/Facilitate online courses	0	1	1	2
Unaware	0	0	2	2
Compete with cyberschools	0	1	0	1
Easier submission of assignments	0	0	1	1
Keep up with tech trends	0	1	0	1
Personal choice	0	1	0	1

Note. This table displays a frequency distribution of responses to survey question 2. The three highest-ranked reasons were actual choices in the question. All other reasons listed were manually entered by survey participants who selected the "Other" choice for this question. Similar reasons that were spelled or worded differently were combined together in this table.

The administrator interviews revealed that the reasons the three participating school districts had for selecting Moodle as their LMS of choice generally reflected what the teachers expressed. District A implemented a Cyber Academy for students who are interested in taking college courses in addition to their regular subjects or students who are unable to consistently attend classes due to work commitments, extracurricular activities, or other factors (Interview 12, personal communication, October 24, 2014). District B developed elective classes in Moodle that were not previously available and, as a result, began taking a blended (or hybrid) approach to student learning, which combines online instruction with traditional classroom instruction (Interview 5, personal communication, October 20, 2014). One specific example of this was a remedial science course designed by a teacher. In this course, the students complement review

activities conducted by the teacher with virtual labs where they are encouraged to find their own way to conduct the experiments that are presented to them (Interview 7, personal communication, October 20, 2014). District C also selected Moodle as a hybrid learning platform. In this school district, the teachers who use Moodle do so as a repository for their lectures, assignments, and projects. The students still attend an actual class where the teacher gives live instruction, but then use Moodle to access all the notes and assignments for that class (Interview 15, personal communication, October 31, 2014).

Success School Districts Have with Meeting Goals of Using an LMS

As a follow-up to the question regarding why these school districts subscribe to IU8's Moodle service, the survey respondents were asked to share their perception of the level of success their school districts are having with Moodle as it relates to the reasons why these school districts decided to implement it. They were required to base their answer on a scale of 1 to 5, with 1 representing *not successful* and 5 representing *very successful*. Table 7 displays the mean values of the responses for each school district and the entire sample.

Table 7

In Your Opinion, On a Scale of 1 to 5, How Successful Has the District Been in Meeting Its Goals for Using Moodle?

School District	Mean
District A	3.05
District B	2.91
District C	2.64
Overall	2.89

Note. This table displays the mean values of responses to survey question 3. Participants were required to answer this question by selecting a number from 1 to 5, with 1 representing *not successful* and 5 representing *very successful*.

According to the data, the teachers believed that their school districts were, at best, moderately successful in meeting their goals for using Moodle. Teachers in all three school districts declared that Moodle was effective in helping them to organize material and have it available for students so they can work on it at their own pace. According to one teacher:

> [The students] don't have to be in [the] classroom all the time to access something. They can do some projects at home if they need to, probably, and having everything in one place instead of me having to pass it out or have a textbook with me or something like that, I can have everything … My entire curriculum is in one place on the Moodle website and that Moodle website can be accessed from anywhere where anybody has any Internet connection. (Interview 21, personal communication, November 10, 2014)

However, one challenge with using Moodle was brought up in the interviews at two school districts. It was stated on three different occasions that a number of students in those school districts do not have access to a computer or the Internet outside of school. As a result, it is difficult for a teacher to make Moodle use mandatory for a homework assignment (Interview 2, personal communication, October 20, 2014). Another interview subject added that the lack of a computer and/or Internet can prompt some students who are contemplating participation in cyberschool to enroll in a cyber charter school, where these resources are usually provided as part of the tuition (Interview 12, personal communication, October 24, 2014).

From the administrators' perspective, another reason for the perceived lack of success is the perception that the majority of the teachers still do not totally understand the opportunities that Moodle provides for student learning enhancement. One administrator admitted that teacher in-service time is mostly devoted to mandatory trainings and initiatives. As a result, very little in-

service time has been dedicated to training the teachers how to use Moodle (Interview 15, personal communication, October 31, 2014).

Perceived Usefulness

Five items from Davis' (1989) scale were included in the survey to measure the teachers' PU of Moodle. The teachers were asked whether Moodle (a) improved their job performance, (b) enabled them to accomplish tasks more quickly, (c) improved the quality of work that they did, (d) made it easier to do their job, and (e) was useful in their job. For each scale item, the respondents submitted a value from 1 to 5, with 1 representing *strongly disagree*, 2 representing *disagree*, 3 representing *neither agree nor disagree*, 4 representing *agree*, and 5 representing *strongly agree*. The mean values of each PU scale item are displayed in Table 8 for each school district and the entire sample.

Table 8

Perceived Usefulness by School District

	Mean			
PU Scale Item	**District A**	**District B**	**District C**	**Overall**
Improves job performance	2.64	2.44	2.53	2.55
Accomplish tasks more quickly	2.68	2.39	2.56	2.56
Improves quality of work	2.61	2.39	2.49	2.51
Makes it easier to do job	2.61	2.42	2.60	2.55
Find Moodle to be useful in job	2.63	2.53	2.58	2.59

Note. This table displays the mean values of responses to survey questions 5a to 5e. Participants were required to answer these questions by selecting a number from 1 to 5, 1 representing *strongly disagree*, 2 representing *disagree*, 3 representing *neither agree nor disagree*, 4 representing *agree*, and 5 representing *strongly agree*. PU = perceived usefulness. Adapted from "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," by F. D. Davis, 1989, *MIS Quarterly, 13*(3), p. 324.

Despite the low numbers displayed in Table 8, teachers who were interviewed explained ways that Moodle is useful for them. One teacher pointed out that Moodle allows students to work independently and interact with technology that is new to them, both which, in turn, help to

prepare these students for postsecondary education that is becoming more technology-based as time goes on (Interview 9, personal communication, October 22, 2014). Another teacher described how Moodle helps students navigate through a lesson:

> I think it works really well by [the students] being able to see everything and see how much they have to do … the whole unit is straightforward and laid out to where the kids can say, "Okay, this is coming next." (Interview 7, personal communication, October 20, 2014)

Moodle can also be used to help students keep up with the material when they miss school, as explained by this teacher:

> I thought it would be an easy way to keep things organized for kids so that when [they were] absent, they could quickly go in there and I can point to them what section we had worked on while they were absent or get them caught up quickly. (Interview 8, personal communication, October 20, 2014)

However, other teachers reiterated that they would have a hard time using it in certain classes due to the number of students within their school district that do not currently have Internet access at their homes. One teacher expanded on this by saying:

> … it just doesn't seem like would be equitable to all the kids if a kid can go home and access it and another kid can't. How do you do it when you start submitting assignments on there and you tell me that you have to submit it on there and half of the class raise their hands and say, "I can't unless we do it at school."? (Interview 8, personal communication, October 20, 2014)

Another teacher also mentioned that Moodle would probably not be a good fit with her ninth-grade English class because "it's difficult enough to get them to know how to e-mail" (Interview 19, personal communication, November 10, 2014).

Perceived Ease of Use

The teachers were also given five items from the Davis (1989) scale to measure their PEOU regarding Moodle. They were asked to respond to five statements on a scale of 1 to 5 with 1 representing *strongly disagree*, 2 *representing disagree,* 3 representing *neither agree nor disagree,* 4 representing *agree*, and 5 representing *strongly agree*. The statements were:

a. Learning to use Moodle is easy for me.
b. It is easy for me to become skillful in using Moodle.
c. I find Moodle to be flexible to interact with.
d. I find it easy to get Moodle to do what I want it to do.
e. Overall, I find Moodle easy to use.

The mean values of each PEOU scale item are displayed in Table 9 for each school district and the entire sample.

Table 9

Perceived Ease of Use by School District

	Mean			
PEOU Scale Item	**District A**	**District B**	**District C**	**Overall**
Learning to use Moodle is easy	2.84	2.65	2.60	2.71
It is easy to become skillful	2.82	2.65	2.62	2.71
Flexible to interact with	2.85	2.60	2.53	2.69
Easy to get Moodle to do what I want	2.79	2.56	2.51	2.64
I find Moodle easy to use	2.87	2.60	2.71	2.75

Note. This table displays the mean values of responses to survey questions 5f to 5j. Participants were required to answer these questions by selecting a number from 1 to 5, 1 representing *strongly disagree*, 2 representing *disagree*, 3 representing *neither agree nor disagree*, 4 representing *agree*, and 5 representing *strongly agree*. PEOU = perceived ease of use. Adapted from "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," by F. D. Davis, 1989, *MIS Quarterly, 13*(3), p. 324.

Three teachers in District A felt Moodle was very easy to use, especially after they created their first course. One teacher said it took her about half of a day to create her first course, but she said, "I think I could create another one on my own and in about the same time or less, probably" (Interview 9, personal communication, October 22, 2014). Another teacher mentioned, "I found it very simple … I still think I can do more. I'm still kind of learning many of the tools that are available. Definitely, it was not difficult to understand" (Interview 10, personal communication, October 24, 2014). A third teacher declared, "After I wrote the one class in it, once you have it, it's pretty easy to use, I believe. So, I'd go in there and tweak things. So, yeah, I thought it was fairly easy" (Interview 11, personal communication, October 24, 2014).

In the other two school districts, however, there were differences of opinion. One teacher in District B expressed the difficulty he had in creating a course. He explained:

> I was given a handout by the teacher at the school which detailed the nuts and bolts, the basics of Moodle, and the creation of an online course. I "Moodled" my

> way through it. In many ways the "Moodling" was muddling, but the end result, I was able to devise an online course. Not being particularly computer savvy, I had my share of struggles, but with the aid of the handout and just generally speaking, I guess the term user-friendliness applied. I was able to create a legitimate course and probably 150 hours or so of time and effort for a year-long online course. (Interview 1, personal communication, October 20, 2014)

An administrator at District B admitted that "[there are] some quirky things with Moodle. You never know entirely whether it's a quirk with Moodle or a quirk that the teacher did wrong" (Interview 4, personal communication, October 20, 2014). An employee at District B who is responsible for training the teachers on how to use Moodle expanded on that by saying:

> … it takes a lot of professional development for them to know how to just use Moodle in general. It can be … confusing for them to know how to upload [a video] correctly … and then how to position … to design it aesthetically, I guess, on the screen, to know how to move the videos to the right place or to get pictures to show up where they want them to appear because sometimes they have trouble understanding all the tools that are there. (Interview 3, personal communication, October 20, 2014)

In District C, one teacher credited a trainer from IU8 with giving her the knowledge and confidence to begin creating Moodle courses. She said:

> If I had to add additional text to something or to put in tiny little pull words, it would have taken me a while to figure that out. If I hadn't had that trainer, I think it would have been a lot more difficult for me. (Interview 17, personal communication, November 4, 2014)

Summary of Teacher Perceptions

The teachers who participated in this study believe their school districts subscribe to IU8's Moodle service for different reasons depending on where they teach. District A teachers generally believe Moodle was implemented to support their school district's cyberschool program. Teachers in District B feel that Moodle is used to provide elective courses for the students that have not been offered in past years. District C teachers perceive Moodle mostly as a catalyst to incorporating a hybrid learning program within their school district. No matter what the reason, the teachers believe that their districts have been moderately successful in meeting their goals for using Moodle. In addition, according to the data, the teachers in the study sample do not generally regard Moodle as being a useful tool to enhance their instruction. They also, as a group, perceive Moodle to be slightly difficult to use.

RQ_4: How Are Teachers in These School Districts Encouraged to Use an LMS?

To answer this research question, a mixed-methods approached was used. Quantitative data indicated who were encouraging the teachers to use Moodle, while a mixture of qualitative and quantitative data revealed who were more influential with their encouragements. First, the teachers were asked to indicate who encouraged them to use Moodle in their school district. They were given the following options: (a) another teacher, (b) their building principal, (c) student demand, or (d) no one. A fifth choice was available for the teachers to select if someone else encouraged them to use Moodle. If selected, the teachers were able to specify who encouraged them by entering their response in a text box. The results are displayed in Table 10, where a frequency distribution is included for each school district and the entire sample.

Table 10

Encouragers of Moodle Use by School District

Encourager	**District A**	**District B**	**District C**	**Total**
No one	33	24	26	83
Curriculum coordinator/director	0	9	7	16
Another teacher	5	3	3	11
District administration[a]	3	4	4	11
Building principal	7	0	0	7
Cyber Academy coordinator	6	0	0	6
Not applicable	3	1	1	5
Training instructor	2	0	2	4
Not sure	2	0	1	3
Federal programs director	0	1	0	1
Student demand	1	0	0	1
Superintendent	0	1	0	1
Technology coach	0	0	1	1

Note. This table displays a frequency distribution of responses to survey question 4. The actual choices in this survey question were *Another teacher*, *My building principal*, *Student demand*, *No one*, and *Other*. The remaining reasons listed were manually entered by survey participants who selected the *Other* choice for this question. Similar reasons that were spelled or worded differently were combined together in this table.
[a] Individual not specified.

According to the data, 55% of the teachers surveyed were not encouraged to use Moodle. This reflects the results of RQ_2, which declared that encouragement had no effect on a teacher's level of LMS use. However, a follow-up analysis of those results revealed that encouragement from school district administrators had more influence on the teachers' use of Moodle than encouragement from other teachers. This analysis is illustrated in Table 11:

Table 11

Relationship Between Moodle Use and Encouragement of Moodle Use Among Teachers Who Were Encouraged

	Teachers Using Moodle?[a]	
Encourager	**Yes**	**No**
Another teacher	2	9
Building principal	2	5
Student demand	0	1
District administration[b]	7	22
Other	4	15

Note. This table compares responses from survey question 4 to responses from survey question 1. The data from all three school districts have been combined for this test. Responses from teachers who selected *No one* for survey question 4 were not included in this analysis. Contingency coefficient (C = .96) calculated using Chi-square (χ^2 = .63) test with $p < .05$ and df = 4.

[a] Teachers were asked if they currently use Moodle as a tool in any course that they teach.

[b] Includes superintendent, curriculum coordinator/director, and federal programs director.

Using the same requirements mentioned in the test for H_1 (see page 43), the results from this comparison ($p < .05$, df = 4, χ^2 = .63, C = .96) reveal the relationship between these two variables is very strong (Blaikie, 2003).

The survey data displayed in Table 11 and the interviews indicated that, when teachers were encouraged to use Moodle, the encouragement came mostly from school district administrators. Interview participants in Districts A and B mentioned that the administration approached each department to devise at least one online course. In District A, the Cyber Academy Coordinator met with each high school department and talked with teachers about creating online courses and offering them through Moodle (Interview 14, personal communication, October 24, 2014). In District B, "the faculty here was approached by the administration … we weren't pressured, but in a constructive way … the initiatives started with the administration getting the departments to devise at least one [Moodle course]" (Interview 1,

personal communication, October 20, 2014). However, encouraging Moodle use in District C has been difficult. According to one school district administrator:

> … our in-service time is pretty much eaten up … between mandatory trainings and really big shared district topics like literacy strategies and some other things. There's been really little in-service time that we've even had to devote to anything peripheral or even anything supportive, whether it be technology or anything else. And, so, in the past, we have offered some … after school workshops, voluntary if people want to show up. Those are usually pretty poorly attended and so, at this point, I don't know that our teachers at our high school really have a good handle on it or really know all of the … opportunities that it might provide for them. (Interview 15, personal communication, October 31, 2014)

In addition to encouragement from administration, one administrator from District B mentioned some teachers are hearing success stories from their colleagues and students, which, in turn, are influencing them to use Moodle. He stated:

> … as teachers use it, they're spreading the word that … their kids are able to go and access things at home that they forgot from school or, you know, in the blended sense, not necessarily in just the online nature, but in the "I'm sitting in a regular chemistry class and now I have a chemistry that's existing online in a blended way." Our teachers are really giving the feedback to one another that they're finding success with that platform. So, as a result of that, now it's become something that the teachers are jumping on board because they want the benefits that it's bringing. (Interview 4, personal communication, October 20, 2014)

In conclusion, regardless of whether they actually use the LMS, when teachers are encouraged to use it, that encouragement occurs primarily in one of two ways. Either school district administrators encourage teachers to use the LMS during department or full faculty meetings, or the teachers find success with using LMSs themselves and share their experiences with other teachers.

RQ_5: What Factors Are Most Influential for Each School District to Continue Using the LMS?

The interviews with administrators from the participating school districts provided the researcher with detailed information regarding why these school districts continue to utilize Moodle, which enabled him to answer this qualitative research question. According to these interviews, one of the biggest influences in the decisions to subscribe to Moodle was the cost compared to other LMSs. Specifically, all three school districts used Blackboard in the past and switched to Moodle due to a lower annual cost for hosting, training, and technical support of the LMS. Although these three school districts all listed cost as a major contributor to their initial purchase and subsequent renewals of Moodle, each school district pointed out specific factors that have influenced them to continue using this particular LMS.

The most influential factor for District A's continued participation in Moodle is the operation of its Cyber Academy. However, this participation may be lowered during the next few years, if not discontinued, due to the decision to purchase another LMS, Compass Learning. An administrator at District A explained:

> I think because of the concern that we cannot get every teacher to step up and offer their course online, [District A has] looked and considered [Compass Learning] to switch to because they basically, you know, have the curriculum

> there. It's really just the teacher manages it, grades the assignments, and gives the students the grades, but the curriculum and everything is already there. I think for us, being a smaller district and not having as many teachers that are willing to put the curriculum together and put it online and the whole fear of technology, I think that's the reason that they've decided to go into the other program. (Interview 14, personal communication, October 24, 2014)

However, this administrator, along with the Cyber Academy coordinator, stated that the elective courses will still be accessed via Moodle at this time because those courses have already been designed specifically for their school district. The Cyber Academy coordinator describes Moodle as "a major component of what we do, even if it isn't the sole component of what we do" (Interview 12, personal communication, October 24, 2014).

District B envisions a continuation of Moodle use for the next several years because its popularity seems to be growing among the teachers as they become more familiar and less afraid of the LMS. According to one school district administrator:

> Teachers saw [Moodle] as being something that they felt could potentially eliminate their need in the school district, and that was said. It was said in meetings where we talked about the vision and the goals. So, as they became aware that, "No, this is a tool for you and, in fact, what it does is makes you even more valuable," then it's become now something that they're not afraid of anymore. They now understand that it's something that they can use. So, as a result of that, this experience that I just had 15 minutes ago, where the teacher came in to me and said, "Hey, we'd like to set up all of our science classes in a blended online format." I had no conversation with that person ahead of time.

> They got that by way of students coming and saying or doing certain things in other classes, by way of discovering that it's working well with some of their colleagues and their peers, or just by way of the fact that they realize, "I need to catch up with the times." So, it's kind of gone from something that initially people were pushing away, saying "This is going to take our job," to now my experiences are [teachers] coming and asking and saying, "How can we learn more about it?" In this case, the group literally is going to take their own time after school to learn how to use Moodle where before we were having to force them to, now they're wanting on their own. (Interview 4, personal communication, October 20, 2014)

In District C, there has been a push by administration to get teachers to collaborate more often with each other. Moodle has been used by this school district in its teacher induction program on a monthly basis where the teachers login and respond to a common question based on a scenario that is presented. One school district administrator pointed this out regarding the use of Moodle for this purpose:

> … it gives the teachers a voice. I think one of the things that happens at the high school level is a lot of teachers don't realize that some of things that they're experiencing aren't solely just them. Other teachers are starting to see, so that helps them be less critical and more willing to share, to promote change rather than internalize it … (Interview 18, personal communication, November 10, 2014)

This desire for collaboration has led to a belief from this administrator that the need for Moodle is only increasing, although another administrator stated that the school district would

continue to use Moodle unless something else was discovered that works better and remains cost-effective (Interview 23, personal communication, November 17, 2014).

RQ$_6$: How is the LMS Helping These School Districts Meet Their Educational Technology Goals?

The qualitative approach helped answer this research question by (a) indicating the educational technology goals of each school district and (b) how Moodle was helping each school district meet their goals for using educational technology. As mentioned in the previous section, one of the major goals District A has regarding educational technology is to prevent its students from leaving the school district in favor of a cyber charter school by improving its Cyber Academy. This school district is working toward this goal by trying to increase the number of electives that are available for students to take. Moodle is currently being used by District A for this purpose. District A's Cyber Academy coordinator described:

> … our elective expansion is strictly through Moodle, so … without Moodle, I think that … we're not meeting that goal of expanding our electives and therefore, we're not meeting the goal of keeping students within our district because … if we're not offering kids things that they want then they're going to leave us. (Interview 12, personal communication, October 24, 2014)

He also stated that 67 students have utilized the Cyber Academy this year in some way, whether it was taking a single course or a full online schedule. This number has been consistent with Cyber Academy participation in previous years.

District B strives to use educational technology to support instruction in almost all of its classes. In particular, this school district believes technology can get its students to achieve a

higher level of learning than they would be able to without technology. One school district administrator expanded on this by stating:

> Hopefully, [our students will] get to the point where they know where they're at and they know that they need to revisit a topic. They know that they need additional practice in an area because they're not successful there. That whole idea of self-assessing and then redirecting yourself where you need to be, I would love to see our students get to that point. I think that if they're so dependent upon the teacher, like a normal classroom setting often is, then we're doing a disservice to them, and I'm sure you've experienced that with the self-motivation that it takes to go through a project like you're working on. Our students, a lot of them don't have any idea because we've not exposed them to that type of experience. So, I do believe that we can get there utilizing technology and some of the tools that are available to us. (Interview 5, personal communication, October 20, 2014)

Moodle helps District B support instruction in a way similar to how it helps District A, by enabling District B to offer elective courses that were not previously offered. Another school district administrator presented this example:

> First off … our goal was to try to help [District B]'s kids to realize that the Internet and learning online is something that can bring the world to [District B] where before … [District B], being such a small school in a small place, we … felt a little bit isolated … because we don't have a computer science teacher. So, that meant that you can't go into computer science. Well, through Moodle and through some of the online means that we have now, the kids have discovered that

> they can have an online or a computer science class. (Interview 4, personal communication, October 20, 2014)

District C has one goal for educational technology, that it be used to enhance instruction. Moodle does this for District C by providing teachers with "another tool in their repertoire to make instruction either more engaging, more efficient, or broadening it outside the classroom for their students" (Interview 23, personal communication, November 17, 2014). Teachers interviewed at District C pointed out that Moodle enhanced their instruction by giving them flexibility in regards to how they distributed their assignments and how their students accessed it. One teacher stated, "I was able to pretty much post anything for my students online. So, instead of having 10 students come to me and ask for copies of assignments or copies of rubrics, they could just go online" (Interview 17, personal communication, November 4, 2014). Another teacher added, "It sort of reinforces everything. If I go too fast on my lectures, according to one student, they could go home and read the lecture and copy the notes at their own pace (Interview 21, personal communication, November 10, 2014).

CHAPTER 5

DISCUSSION

Summary of the Study

Researchers have published studies that have investigated either LMS use at the K-12 and collegiate levels or the perceptions of students and teachers regarding LMS use. However, only a few studies have focused on how these perceptions actually affect the level of LMS use in the classroom. This study began to address this gap and revealed factors that affected the use of an LMS in three selected school districts located in the IU8 service area. This was accomplished by answering the following research questions:

RQ_1: How do teachers' perceptions of an LMS affect their levels of use?

RQ_2: Do encouragements from others affect the teachers' level of use of the LMS?

RQ_3: What are the perceptions of teachers in three IU8 school districts regarding use of an LMS in their classes?

RQ_4: How are teachers in these school districts encouraged to use an LMS?

RQ_5: What factors are most influential for each school district to continue using the LMS?

RQ_6: How is the LMS helping these school districts meet their educational technology goals?

A mixed explanatory design was used to answer the research questions. The researcher started by distributing an online survey to 281 teachers employed by the school districts that participated in this study. After a two-week collection period, 150 teachers completed the survey, which provided the researcher with data to answer quantitative research questions RQ_1 and RQ_2. With this data, the researcher determined that teachers' opinions on why a school district

subscribes to an LMS or how successful a school district is in meeting its goals for using an LMS had no effect on their level of LMS use. Also, the teachers' level of LMS use was not affected by encouragement from other teachers or school district administrators. However, it was discovered that PU and PEOU were factors that affected the teachers' level of LMS use.

As a follow-up to the survey, the researcher conducted semi-structured interviews with 14 teachers and nine school district administrators over a period of one month. The interviews with the teachers, along with selected survey data, helped the researcher answer mixed-method research questions RQ_3 and RQ_4. The reasons the participants gave for their school districts subscribing to IU8's Moodle service varied based on the school district. Despite this difference of opinion, the teachers agreed that their school districts have been moderately successful for meeting their goals for using this LMS. They generally found Moodle to be slightly difficult to use and did not generally regard this LMS to be useful for enhancing their instruction. The teachers were encouraged to use Moodle by school district administrators who were trying to implement Moodle district-wide or other teachers who had successful experiences with using Moodle.

The school district administrators provided answers for qualitative research questions RQ_5 and RQ_6 during their interviews. They were asked to give reasons why they decided to start using Moodle and why they want to continue using it in the future. Administrators from all three participating school districts switched from Blackboard to Moodle in order to save money. However, each district had unique factors that prompt them to continue using Moodle. The need to facilitate elective courses in District A's Cyber Academy helps drive its current use of Moodle. In District B, Moodle is gaining popularity due to the teachers becoming more familiar with the

LMS and less afraid to use it. District C is counting on Moodle to increase collaboration among the faculty within the district's teacher induction program.

The school district administrators also talked about how using Moodle is helping them meet their educational technology goals. District A is trying to improve its Cyber Academy by increasing the number of electives that are available for students to take on Moodle. The administrators in this school district are hoping this will help prevent students from leaving their school district and going to cyber charter schools. District B also uses Moodle to offer elective courses that were not previously available. In addition, administrators in this school district are hopeful that their students can achieve a higher level of learning with the help of Moodle. Meanwhile, District C is using Moodle to help enhance instruction by providing teachers in that school district flexibility regarding distribution and student access of their assignments.

Conclusions

Previous studies featured in the literature review have followed the normal distribution adoption curve illustrated by Rogers (1962) in his Diffusion of Innovations Theory (Soffer et al., 2010; Giddens & Walsh, 2010). In this distribution, five categories of innovation adopters are identified:

1. Innovators (2.5% of the distribution curve), who demonstrate a passion for trying new ideas and are responsible for introducing the innovation to their local communities.
2. Early adopters (13.5%), who are the first in their communities to adopt the innovation and usually can determine whether the innovation will succeed.
3. Early majority (34%), the group who adopts the innovation just before the average member of a social system but seldom leads the charge in convincing the rest of the community to adopt.

4. Late majority (34%), the group that usually adopts the innovation due to peer pressure or economic necessity.
5. Laggards (16%), who are the last group to adopt the innovation, usually after a more recent idea supersedes it.

During the 2014-15 school year, the fourth year that IU8's Moodle service has been operational, only 20 of the 150 survey respondents (13.33%) indicated that they used Moodle for at least one of their courses. For the school districts that participated in this study, this puts them in the early adopter stage regarding the adoption of Moodle as an instructional tool. At this stage, resistance from some teachers is still expected. Giddens and Walsh (2010) encountered this when implementing virtual communities into their nursing programs. Likewise, the school districts in this study are dealing with resistance as well. District A's administrators continue to have difficulty with getting all of their teachers to post their courses to Moodle, which prompted them to look at an alternative LMS (Interview 14, personal communication, October 24, 2014). Some teachers in District B were initially against the idea of using Moodle for fear of losing their jobs, but are starting to come around (Interview 4, personal communication, October 20, 2014). This continued resistance could be a reason why teachers in these school districts are adopting Moodle at a slower pace compared to previous studies, such as Soffer et al.'s (2010) study where Tel-Aviv University achieved the early majority stage during the second year of its LMS implementation (22%).

RQ_1: How Do Teachers' Perceptions of an LMS Affect Their Levels of Use?

This slow pace of adoption is caused partially by the teachers' PU and PEOU of Moodle. According to the data, the survey participants as a whole did not find Moodle to be useful for enhancing their instruction or generally easy to use. Also, as stated earlier, only 13.33% of the

participating teachers indicated that they actually use Moodle for at least one of their courses. In the literature, PU and PEOU are considered key predictors for user acceptance of any technology according to the Technology Acceptance Model (Davis et al., 1989). This was illustrated in previous studies (De Smet et al., 2011; Hu et al., 2003; Lee & Lee, 2007; Al-alak & Alnawas, 2011) as well as this particular study, where the researcher found two significant relationships: (a) a strong relationship between PU and LMS use and (b) a strong relationship between PEOU and LMS use. As a result, the researcher was able to successfully build on PU and PEOU as predictors from the original Technology Acceptance Model framework (Davis et al., 1989). This study is another example of how PU and PEOU must be taken into consideration before teachers adopt an LMS for use in their courses.

RQ_2: Do encouragements from Others Affect the Teachers' Level of Use of the LMS?

According to Socio-Technical Systems Theory, success of a technology implementation in an organization is dependent on the ability and willingness of users to adopt that technology (Dillon & Morris, 1996). In most cases, user buy-in can happen if management is able to convince the users that the technology is essential for helping the organization to meet its goals (Applebaum, 1997). Pynoo et al. (2011) found that social influence exerted by superiors was considered a main predictor of LMS acceptance by teachers in a particular secondary school. In this case, the principal strongly encouraged his teachers to use the LMS and stated that it would be used as the school's official bulletin board. Another example of top-down encouragement of LMS use featured in the literature included a government initiative from Qatar (Nasser et al., 2011). In this initiative, the government explained to the school administrators how the LMS would help promote information and communication technologies in schools. In turn, the administrators were responsible for persuading their teachers to use LMSs. However, in this

particular study, encouragement was not a factor in whether a teacher adopted Moodle. The data revealed no significant relationship between how a teacher is encouraged to use Moodle and that teacher's use of Moodle. This was not due to a lack of effort from the school district administrators, who were active in explaining the benefits of Moodle and providing training and support resources for this LMS (Interview 4, personal communication, October 20, 2014; Interview 15, personal communication, October 31, 2014). As stated earlier, the teachers as a group did not perceive Moodle to be particularly useful for their courses or easy to use. Since the data showed significant relationships between PU and Moodle use and PEOU and Moodle use, this implies that most of the teachers are still not buying in to Moodle. This lack of acceptance affects the overall adoption of Moodle in these school districts. As a result, Socio-Technical Systems Theory can be supported by this study.

RQ$_3$: What Are the Perceptions of Teachers in Three IU8 School Districts Regarding Use of an LMS in Their Classes?

As a whole, the teachers who participated in this study found Moodle to be slightly difficult to use and did not generally regard it as being useful for enhancing their instruction. This is not surprising based on the findings of significant relationships between PU and LMS use and PEOU and LMS use in this study along with the fact that 86.67% of the survey respondents indicated that they do not use Moodle at all. However, these findings conflict with the previous studies of De Smet et al. (2012) and Lee et al. (2010), where LMSs were perceived to be useful and easy to use. Despite the low level of PU and PEOU from the study sample, selected teachers who were interviewed for this study perceived Moodle to be beneficial, stating that the LMS helped them organize their course content, assignments, and other resources in one location (Interview 7, personal communication, October 20, 2014). This allowed their students to review

lessons if necessary, keep up with the material if they miss class, and, in some cases, work independently (Interview 8, personal communication, October 20, 2014). These perceptions were similar to those described in a study of a Grade 3 class in Singapore, where the teachers stated that their LMS had the potential to improve their students' motivation for independent learning (Tay et al., 2011).

In addition to PU and PEOU, one particular perception from the data analysis confirmed an issue that continues to inhibit the growth of LMS use in rural areas. It was revealed in the interviews that a number of students within the participating school districts do not currently have Internet access in their homes, which (a) limits their Moodle activity to computers that are inside their schools (Interview 8, personal communication, October 20, 2014), or (b) forces those students who wish to receive their education online to drop out of their district and enroll in a cyberschool that can provide them with free Internet access (Interview 12, personal communication, October 24, 2014). This issue was described in Judi et al.'s (2011) study as a major factor toward the limited computer use by rural students in Malaysia. In addition, Nasser et al. (2011) indicated in their study that 26.2% of students surveyed did not have Internet access at home.

RQ_4: How Are Teachers in These School Districts Encouraged to Use an LMS?

In previous studies, top-down encouragement approaches were used to persuade teachers to adopt LMSs for their courses. In a K-12 environment, this means school administrators at the district or building levels were responsible for influencing the teachers to use LMSs (Pynoo et al., 2010). The school districts featured in this study were no different. In each school district, administrators were responsible for encouraging teachers to use Moodle. Administrators in Districts A and B tried to encourage each faculty department to create online courses using

Moodle. This was mostly done constructively, with the administrators emphasizing the benefits of Moodle and how it would help them achieve their educational technology goals (Interview 1, personal communication, October 20, 2014; Interview 4, personal communication, October 20, 2014; Interview 12, personal communication, October 24, 2014). District C administrators were similar in their approach to encouraging the teachers, but they addressed the faculty more as a whole (Interview 18, personal communication, November 10, 2014). These methods of encouragement reflect Applebaum's (1997) interpretation of Socio-Technical Systems Theory, which mentioned that management's ability to convince employees that using a technology aligns with an organization's goals can help determine the amount of acceptance the technology will receive from the employees, which in turn, determines the success or failure of a technology implementation.

RQ$_5$: What Factors Are Most Influential for Each School District to Continue Using the LMS?

A number of school districts in Pennsylvania are dealing with financial challenges as a result of students leaving these school districts in favor of cyberschools (Carr-Chellman & Marsh, 2009). In this study, as well as in the literature, LMSs were adopted by school districts in order to increase the number of opportunities available for students to receive their education, which gives these school districts a better chance of retaining their students. For example, District A is using LMSs primarily for students that participate in its Cyber Academy. As was the case in the virtual high school that Reid et al. (2009) studied, District A's Cyber Academy targeted students who wanted to either continue their education using a virtual environment or remain in a traditional school setting but augment their curriculum with elective courses which were available exclusively online (Interview 12, personal communication, October 24, 2014).

This study revealed a similarity between District A's Cyber Academy and the virtual high school featured in Reid et al.'s (2009) article. The faculty and administrators in both schools agreed that a virtual learning environment may not be conducive for all students. Reid et al. (2009) listed high motivation, good time management skills, and strong family support as characteristics a student must have to be successful in a distance education environment. Administrators from District A acknowledged this and, as a result, have an approval process in place for students wishing to participate in the Cyber Academy to ensure that these students will be successful in a virtual setting (Interview 12, personal communication, October 24, 2014).

RQ_6: How is the LMS Helping These School Districts Meet Their Educational Technology Goals?

Socio-Technical Systems Theory suggests that a technology implementation must be able to help an organization to meet its goals in order for it to be successful (Dillon & Morris, 1996; Applebaum, 1997). In all three participating school districts, IU8's Moodle LMS is being used to help meet particular goals these school districts have for their use of educational technology. In the case of District A, Moodle is addressing the school district's goal of preventing its students from dropping out in order to attend a cyber charter school. It is doing this by providing elective courses to students who are participating in the school district's Cyber Academy. Administrators and teachers in District A are working to increase the number of electives that are being offered to help convince students who are requesting particular courses or a complete online education to remain enrolled with the school district (Interview 12, personal communication, October 24, 2014). This practice has actually been a foundation for virtual schools since their inception. This is confirmed in Reid et al.'s (2009) study of a virtual high school in which the district targeted

both students who wanted to take electives that were not previously offered and those who wanted to receive their entire education online.

District B also uses Moodle to offer elective courses that were not previously available, but it also aspires to use this LMS and other forms of educational technology to support instruction in almost every class. Administrators in this school district are hopeful that their students can begin to evaluate their own learning and motivate themselves to remediate or explore advanced concepts with the use of technology (Interview 5, personal communication, October 20, 2014). Teachers in this school district who were interviewed generally thought Moodle helped them organize their work so it would be easy for the students to follow it, and there were some instances where students would be able to go at their own pace in particular subjects (Interview 7, personal communication, October 20, 2014). However, the significant number of families in the school district who lack home Internet access limited what the teachers can do with their students on Moodle (Interview 8, personal communication, October 20, 2014). These perceptions were similar to a group of Grade 3 teachers in Singapore who stated that their LMS had the potential to improve their students' motivation for learning, but seamless use of this LMS depended greatly on the efficiency of their Internet access (Tay et al., 2011).

District C strives to make sure any educational technology they use enhances instruction. Moodle helps enhance instruction for teachers in this school district by giving them a repository that provides them with flexibility regarding how assignments are distributed and accessed by students, similar to how the Claroline LMS was used in Greece (Papastergiou, 2007) and the Smartschool LMS was used in Belgium (Pynoo et al., 2011). The District C teachers who use Moodle generally post lecture notes, assignments, and projects that are due (Interview 17, personal communication, November 4, 2014; Interview 21, personal communication, November

10, 2014). However, one teacher that was interviewed stated he makes use of the discussion forums to promote student collaboration (Interview 20, personal communication, November 10, 2014), which was also a heavily used feature of the LMSs studied by Papastergiou (2007) and Pynoo et al. (2011).

Theory Implications and Contributions

This study helped illustrate the basic assumption of the Technology Acceptance Model, which states that PU and PEOU can predict user acceptance of any technology (Davis et al., 1989). According to the results, both PU and PEOU had significant relationships with LMS use among the participating school districts. In this case, PU and PEOU values were low, as well as the percentage of teachers that used Moodle. The low PU and PEOU values imply that the majority of the teachers in these school districts are still not accepting Moodle as a viable resource, which confirms what Dillon and Morris (1996) state about Socio-Technical Systems Theory, where "the gainful employment of any technology hinges on the ability and willingness of users to employ it for worthwhile tasks" (p. 22).

Although previous studies based on the Technology Acceptance Model have revealed that management support has a significant effect on PU and PEOU (Lee et al., 2003), the results from this study could challenge that claim. As mentioned in the interviews, administrators from all three participating school districts have provided support and training for Moodle to their teachers (Interview 4, personal communication, October 20, 2014; Interview 14, personal communication, October 24, 2014; Interview 15, personal communication, October 31, 2014). However, this did not translate to a high level of PU and PEOU across these districts. According to the data from this study, encouragement from administration had no effect on a teacher's use of Moodle. The significant relationships between PU and LMS use and PEOU and LMS use

mentioned earlier implies that encouragement did not affect the level of PU and PEOU in this study.

In addition, the understanding of rate of adoption as it pertains to the Diffusion of Innovations Theory is enhanced by the results of this study. According to Rogers (1995), perceived attributes such as relative advantage and complexity are important explanations of an innovation's rate of adoption. Lee et al. (2011) mentioned that high levels of relative advantage in an innovation lead to high levels of PU and high levels of complexity lead to low levels of PEOU. The low levels of PU and PEOU found in this study therefore imply that the LMS has a relatively low level of relative advantage and high level of complexity that is affecting the rate of adoption within the participating school districts.

Recommendations for Future Study

In this study, the researcher focused on the use of a Moodle LMS by three school districts during the 2014-15 school year. By applying the Diffusion of Innovations Theory, it was determined that these districts were all in the early adopter stage of their Moodle LMS implementations after beginning use of this LMS three years ago. In order to see if these school districts will eventually reach the point where the greater majority of teachers adopt Moodle, a longitudinal study covering at least the next five school years is recommended. This future research should show that these districts are either committed to using Moodle long-term or just waiting for a perceived better LMS to come along. A minimum of five years is suggested because, in an earlier study, LMS adoption was measured over a period of eight years, where the peak adoption rate of 80% was found after the seventh year of implementation (Soffer et al., 2010). Therefore, to make a true comparison, years four through eight of IU8's Moodle service should be analyzed, which would be a period of five years.

One finding that stood out in the data analysis was the revelation from three interview subjects (one from District A, two from District B) that a number of students in their districts do not have access to a computer or the Internet outside of school. This is an issue that was indicated in the literature as one that interferes with LMS use in rural settings (Judi et al., 2011; Nasser et al, 2011), but was not addressed by this study. A future study could be conducted that investigates the actual percentage of families located in Districts A, B, and C that do not have Internet access at home and how that affects LMS use in these school districts.

In addition to the three school districts featured in this study, other school districts within the IU8 service area are currently using LMSs in their curriculum as well. One district is actually hosting Moodle on one of its own servers. A few districts are utilizing other LMSs such as Blackboard and Blended Schools. In addition, IU8 recently signed an agreement with Instructure, owner of the Canvas LMS, in order to provide another LMS option, including training and support, to its member districts. It should also be pointed out that over 20 school districts in the IU8 service area are currently using Google Apps. It is possible that a number of these school districts may consider using Google Classroom to enhance instruction if Google continues to add features to that system that would make it more comparable to other LMSs. As a result, the researcher recommends that future studies be conducted regarding LMS use that is not limited exclusively to districts that use Moodle. Expanding research to include school districts that use other LMS platforms will provide researchers with a larger sample, which will further help determine the factors that are most influential to these school districts in regards to selecting and using an LMS.

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APPENDIX A

LETTER TO SCHOOL DISTRICTS

1414 Spruce Street
Hollidaysburg, PA 16648

[Date of Letter]

[School District Name]
ATTN: [Superintendent]
[School District Address]

Dear [Superintendent]:

I am currently working on my dissertation as required to earn a Ph. D. in Communications Media and Instructional Technology from Indiana University of Pennsylvania. The purpose of my dissertation is to explore the factors that influence the use of Moodle in selected IU8 school districts. I am requesting permission to include your school district as a participating site in this study.

My data collection will consist of two phases. First, a survey will be distributed to all teachers in your district. After that data is collected and analyzed, six or seven interviews will be conducted with selected teachers and administrators. It is my intent to collect this data before the end of the 2013-14 school year.

I am in the process of securing IRB approval for this research project. If permission is granted, subject participation in surveys and interviews will be strictly voluntary. In addition, all school district, teacher, and administrator names will be kept confidential. Please respond in writing as soon as possible if you would like your school district to be included in this study. If you have any questions regarding this process, please feel free to contact me via cellphone (814-421-0754). Thank you.

Sincerely,

Derek S. Jones

APPENDIX B

INITIAL SURVEY

Name: _____ School District: _____

(All names will remain confidential.)

Please answer the following questions:

1. Do you currently use Moodle as a tool in any of the courses that you teach?
    a. Yes
    b. No
2. Why do you think your district decided to subscribe to Moodle?
    a. To incorporate it as part of a hybrid learning program.
    b. To offer extra courses to students that were not previously available.
    c. To incorporate it as part of a district cyberschool program.
    d. Other (please specify)
3. In your opinion, on a scale of 1 to 5, how successful has the district been in meeting its goal(s) for using Moodle? (1 = not successful, 5 = very successful)
4. Who has been encouraging you to use Moodle in your district?
    a. Another teacher
    b. My building principal
    c. Student demand
    d. No one
    e. Other (please specify)
5. Respond to the following statements on a scale of 1 to 5 (1 = strongly disagree, 5 = strongly agree)

a. Moodle improves my job performance.

b. Moodle enables me to accomplish tasks more quickly.

c. Moodle improves the quality of the work I do.

d. Moodle makes it easier to do my job.

e. Overall, I find Moodle to be useful in my job.

f. Learning to use Moodle is easy for me.

g. It is easy for me to become skillful in using Moodle.

h. I find Moodle to be flexible to interact with.

i. I find it easy to get Moodle to do what I want it to do.

j. Overall, I find Moodle easy to use.

APPENDIX C

SURVEY ADVERTISEMENT E-MAIL TO TEACHERS

[Date of E-mail]

Dear Educator:

My name is Derek Jones, Ph.D. candidate in the College of Education and Educational Technology at Indiana University of Pennsylvania. I am currently developing a dissertation that explores the factors that contribute to the use of the Moodle learning management system in selected school districts.

With the approval of your district's administration, I am distributing a survey to all teachers within your district. I would appreciate it if you would contribute to my research by completing this survey. If you wish to participate, the survey can be accessed by clicking on the following link:

[Link to Survey]

This survey should take approximately five minutes to complete. As a token of appreciation, if you complete this survey, you will be entered into a drawing for a chance to win one of six $25 Visa gift cards. To be eligible for this drawing, you must complete the survey by [survey deadline date]. Winners will be announced on [winner announcement date]. Thank you.

Sincerely,

Derek S. Jones
Ph.D. Candidate – Communications Media and Instructional Technology
College of Education and Educational Technology
Indiana University of Pennsylvania

APPENDIX D

TEACHER INTERVIEW QUESTIONS

1. Tell me your experiences with using Moodle?
2. Why did you start using Moodle in the first place?
3. How do you use Moodle for your classes?
4. How is using Moodle now different from the way you have used it before?
5. How do you think Moodle helps you achieve your teaching objectives?

APPENDIX E

ADMINISTRATOR INTERVIEW QUESTIONS

1. Why did your district initially subscribe to IU8's Moodle service?
2. How is Moodle different from other LMSs that you have looked at?
3. Tell me about your administrators' and teacher' experiences with using Moodle.
4. What are your district's current goals for using educational technology?
5. How is the use of Moodle helping teachers in your district meet these goals?