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Intrinsic and extrinsic factors that influence instructors' use of e-learning

Salem A. Albalwi
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Intrinsic and Extrinsic Factors that Influence Instructors' Use of E-learning

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Dissertation submitted to the
College of Human Resources and Education
at West Virginia University
in partial fulfillment of the requirements
for the degree of

Doctor of Education
in
Curriculum and Instruction

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and Instructors.

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ABSTRACT

Intrinsic and Extrinsic Factors that Influence Instructors' Use of E-learning

Salem A. Albalwi

The purpose of the study was to determine whether significant differences exist among instructors at King Abdulaziz University's (KAU) Humanities and Scientific Colleges concerning their perceived levels of expertise and current use of e-learning technologies as part of their teaching. The proposed study also assessed influential factors (motivators and barriers) as measured by a survey questionnaire and examined them in terms of sex, academic field, and years of teaching experience.

Statistical methods of analysis for this study used means, standard deviations, frequencies, percentages, factor analysis, a 3-way factorial ANOVA, and Scheffe's Post Hoc Analysis. Based on 227 responses, the findings indicate that instructors at KAU had a positive sense of technological expertise and categorized themselves as "proficient" (51.1%), "expert" (12.5%) and that there was a minimal use of e-learning technologies. Intrinsic factors proved to be more important than extrinsic factors for the motivational factors, and the reverse is true for the barriers.

There were several significant differences among instructors in the main effects and interactions regarding four dependent variables (expertise, current usage, motivation, and barriers) based on three independent variables (A) Sex, (B) Academic field, (C) Teaching experience, and the interactions of the variables together (AB, AC, BC, and ABC).

The significant differences reveal the influence of A, B, C, and the interactions of these variables with the four dependent variables: General expertise - A ($F = 10.244$; $P = 0.002$), B ($F = 6.752$; $P = 0.010$), C ($F = 3.078$; $P = 0.029$), and interactions AB ($F = 8.989$; $P = 0.003$) and BC ($F = 3.540$; $P = 0.016$); Specific expertise - A ($F = 18.230$; $P = 0.000$) and interactions AB ($F = 7.216$; $P = 0.008$) and BC ($F = 2.998$; $P = 0.032$); Current usage - A ($F = 22.594$; $P = 0.000$) and interactions AB ($F = 12.802$; $P = 0.000$) and BC ($F = 3.644$; $P = 0.014$); Motivation showed no significance; and Barriers, only A ($F = 5.447$; $P = 0.021$). Furthermore, this study provides a number of areas where additional research is needed in the future.

DEDICATION

To mom, to the soul of my dad, to my kids, and to
all my family

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*The knowledge of which is only with my Lord. And of knowledge, you (mankind)
have been given only a little* (Holy Qura'n: Al-Isra Verse 85, p.290)

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CHAPTER (I)

Since the beginning of human existence, mankind has sought to develop tools and improve methods that can be used to enhance his work and life. He invented preliminary tools for hunting, growing crops, and sewing clothes. The development continued during the industrial revolution in the sixteenth century until it reached its current state during the twenty-first century. The era of electronic technology started in the eighteenth century, and it has developed in five generations. The fifth generation has been called artificial intelligence. During this era the internet networks were invented in 1969. All of these inventions caused a rapidly growing revolution in communication and information technologies. This revolution formed many challenges for mankind in several aspects. One important aspect that has suffered from challenges in implementing new technologies is teaching and learning.

Without question, electronic technologies have been the greatest agent of change in this century and promise to play an increasing role in the coming decades. It is shifting every aspect of human life, including a system and policy of education. It is breaking old barriers and

building new interconnections in the emerging Global Village. It has also become the chief determinant of up-and-coming nations.

Civilized nations pay strong attention to improve education due to its importance to themselves and their generations. The educationalists have tried to develop the educational knowledge and skills of both the teachers and students. They have conducted research and studies to help both the instructors and the pupils to master these skills. The latest studies were conducted to see how technology can be best used in developing the education.

The developments in education, particularly e-learning, have been synchronized with the development of computer and information technology. These developments, such as using multimedia visualization, computer-assistant learning, virtual classes, and video and audio conferences use the World Wide Web (WWW) for communications between people around the world, including instructors and students. In this study, we focused on determining and assessing the current use of e-learning by instructors in the King Abdul-Aziz University (KAU) in Saudi Arabia. We studied the factors that influence their use of e-learning. This study will hopefully yield improvements and provide

solutions to many challenges that universities may face while implementing e-learning techniques.

Background of the study

Electronic technology is relatively new tool in education and is not expected to be embraced with open arms. That is, there is a normal tendency to resist new ways of doing things. E-learning is a recent innovation that has arisen with the technological computer revolution. Until only a few decades ago, technology consisted of chalkboards, overhead projectors, and printed pages, and today some professors are still using these methods of instruction. Many instructors are reluctant to abandon traditional methods, and the newer technologies are viewed by these individuals as supplementary tools to achieve education's goals. The decision of these instructors to use modern technology is not an outcome but rather a way to assist, enhance, and extend the educational experience (Green, 1997). This learning innovation is developing at a rapid pace and changes in the technology are happening daily. To many people this technology remains confusing because they are not yet comfortable with the innovations; however, countries and people are becoming increasingly

dependent on this important technology. Conole & Oliver (2007) discusses the effects and importance of e-learning:

"E-learning remains complicated, fast-moving and important. We cannot change that; nor can we 'solve' it. This is why it is a complicated but also such a fascinating, exciting area to be involved in - it is its blessing and its curse. What we have attempted to do here is to hold it in focus, to reveal and illuminate facets of this complex phenomenon that we are involved in both studying and producing. Its name may change; its characteristics might vary; different technologies and different practices might fall within its purview. This should not worry us; it is the hallmark of a vibrant, living field of research and practice. We do not fully understand it, and we will not fully understand it; but this should not stop us from trying to, nor from taking delight in the pursuit of understanding it." (p.223)

Today the impetus to move towards e-learning comes from both the supply and the demand sides of the situation. Instructors as well as educational institutions are interested in the "delivery" of courses that may be both cheaper and more efficient, but these methods may be less effective or satisfactory to the interests of the student. Students also want to use the most current materials, and these students request that modern technology be used in their education. However, although both the supply and the demand side of the situation are making requests to use

more modern methods of instruction, the interests of both sides may not entirely coincide (Graham, 2004). Beller & Or (1998) discuss the importance of integrating new learning technologies. They suggested that learning technologies provide a means for improving teaching methods in Universities and educational institutes by implementing electronic multimedia learning materials. These technologies also include visual simulations and demonstrations, accessibility to variety of knowledge data bases; continuous interaction between instructors and peers; and effective use of lessons for discussion. Therefore, new learning opportunities for higher education in particular are available as a result of the integration of these learning technologies.

However, distance learning may cause students to miss interaction with both their instructor and with other students in the class. This lack of interaction can prevent students from benefiting from the immediate behaviors of the instructors or other students and impacts student satisfaction (Schultz, 2001; Fielder, 2003). (Jiang *et al.*, 2006) comment on the need for students to interact with their instructor and claim that students value interaction with the instructor as a crucial element in online learning. New students have had a higher success

rate in instructor-guided online courses than they have in self-study online courses. The first principle, which is of particular importance to e-learning, highlights the interaction between the student and instructor. In order to promote student motivation and involvement, students and instructors should have continual contact. This principle helps to explain why many students comment positively on instructor-guided courses.

Using different potential situations for schools in the future, possible scenarios have been suggested for the instructors, giving these instructors a position in national educational policies. Information and Communication Technology (ICT) influences teaching to become more of a profession rather than a vocation. The modern question not only concerns the improvement of education with the aid of ICT but also changes education and learning, as the rest of society is also transformed.

ICT impacts not only education but also society. It provides new and additional tools and methods to improve education, and it also changes society, education, and knowledge. Education is at the center of these transformations and is also transformed itself by ICT (Dowling & Lai, 2003). The role of the instructor is changing, and the methods that the instructor implements

are also changing. The instructor's role is becoming increasingly more demanding. We evaluate some of the ways that this role is developing, view how modern technologies force us to evaluate the essential roles of the instructor and reinforce specific elements of the profession, in particular the role of mediator, and the role in developing collective knowledge. Dowling & Lai (2004) point out that the instructors must now deal with time and space in a different manner; they use modern instructional settings, which are increasingly global and unite pedagogy and academic life within its entirety. The increasing complexity and the transformations in education lead not only to the evolution of the teaching profession but also to additional teaching professions.

Around the world, higher education is being challenged to accomplish modern demands for the use of ICT to enhance the quality of education. Numerous criticisms of the traditional classroom are frequently encountered, including the lack of personal attention from the instructor, lack of motivation, outdated knowledge and materials, and the inappropriate nature of the instruction for a more diversified population (Gardiner, 1997; Hara & Kling, 1999).

The background information presented will address the definition of e-learning as well as the development of this technology around the world, in particular the Middle East. Many educators and educational policy makers do not fully understand the term "e-learning", but this technology is becoming a world phenomenon. Countries from around the world are beginning to use this technology to facilitate education, and the use of this e-learning is becoming crucial for advanced academic environments. The Middle East has begun to develop and integrate e-learning into educational systems, especially in higher education. Universities in the Middle East are beginning to understand the importance and usefulness of this technology, and the development of e-learning programs in these universities is increasing.

What is e-learning?

E-learning has many different definitions from experts in the field of technology. Some experts believe that e-learning is focused on learning that takes place over long distances, such as the internet. However, not all long distance learning is considered e-learning and not all e-learning is achieved over long distances. Other experts

have argued instead that e-learning involves the use of any electronic technology for educational purposes.

Web technology professionals have defined E-learning, which is short for electronic learning, as an educational process that uses electronic communication technology. Some of these web technology experts consider e-learning to be defined as education and training delivered by an instructor or independently from a set of course materials stored on a database (Berry, 2000). Thus, these experts have defined e-learning as a personalized learning experience that provides measurable results in a web-based forum (Rich, 2001). E-learning programs include independent study, instructor guided web based training, knowledge, management, and performance support (Broadbent, 2000). E-learning refers to the use of internet technologies to deliver a wide variety of solutions that can enhance the students' knowledge and performance. Course solutions are networked, allowing for instant updates, retrieval, distribution and delivery to computer users using standard Internet technology (Rosenberg, 2001). E-learning has also been defined as any long distance instruction that uses electronic technology. For example, some experts have defined e-learning as any mode of distance-learning other

than a correspondence course that uses printed material (Mantyla, 2001).

Other technology experts do not believe that e-learning is limited to long distance learning or web-based forums. These experts believe that e-learning does not have to involve databases or networks. Instead, they argue that any information that is delivered, established or controlled by electronic technology for the explicit purpose of learning is also referred to as e-learning (Hicks, 2000). Web based professionals have focused their definitions of e-learning on specific communications technologies such as interactive whiteboards, email, discussion boards, chat facilities, video conferencing, mobile and wireless tools (including mobile phones), Virtual Learning Environments (VLEs), and learning activity management systems. However, e-learning can also consist of information technologies that do not involve long distance communications such as stand alone desktop and laptop computers, software (including assistive software), video and audio tapes, and even digital cameras. Thus, e-learning should be defined as learning that occurs through the use of any Information and Communications Technologies (ICT). This definition does not limit e-learning to internet learning and does not confuse e-learning with long distance

learning. As shown in Figure (1.1), e-learning contains both computer-based learning and online learning and serves as only a portion of the available methods for distance learning.

Fig 1.1: A model of the relationship of e-learning with some other learning systems.

E-learning can cover a spectrum of activities from electronic resources that facilitate learning to learning that is delivered entirely online as well as blended learning methods that use a combination of traditional and e-learning practices. However, whatever the technology is that is being used, learning is the vital element. E-learning is no longer simply associated with distance or remote learning, but forms part of a conscious choice of the best and most appropriate ways of promoting effective learning on the part of the instructor.

There are three types of e-learning. The first one is the synchronous learning. Synchronous learning takes place in real-time. It is a virtual online classroom that allows classes, discussions, and collaboration to be done via a website for users from different places in real-time. The participants can communicate and participate online with a live instructor as well as other students (Maxey, 2002). The second kind of e-learning is the asynchronous learning. Asynchronous learning does not take place in real-time. It can be accessed at any time. Synchronous learning offers both instructor and learners real time environment therefore, both need to meet at a determined time. It is similar to traditional classroom and all interactions take place in real time. (Oates, & Rengarajan, 2002).

Blended learning is third type of e-learning. It combines both characteristics of classroom and e-learning (Voci & Young, 2001). Example of blended learning is IBM's Basic Blue program that includes wide and different e-learning modules and supported online (IBM, 2004).

Significance of the Study

In spite of the fact that some higher-educational institutes in Saudi Arabia have recently applied e-learning

methods to the teaching process, there is a significant need for performing studies and research in this area to improve the application of e-learning efficiently and effectively. (Cooper & Zmud, 1990) indicate that by incorporating new and varied instructional technologies a necessity is created for researching the potential factors that affect the spread and use of these technologies. Due to the fact that many institutions are only beginning to implement instructional technologies, it is necessary for these institutions to understand the factors that affect the growth and implementation of e-learning technologies.

The objective of this research is to identify strengths and deficiencies that institutes may have which will respectively advance or impede the use of e-learning techniques. The significance of this study is to assess the current usages of e-learning and to determine the factors that influence the e-learning process. The outcomes of this study are intended to serve as recommendations and suggestions for applying the best strategies that could help higher-educational institutes in Saudi Arabia to adopt and use e-learning in their educational process more efficiently and effectively. These outcomes could reflect the integration of e-learning to the educational processes of these institutions so that they will be able to achieve

short and long term goals. This study may also provide pathways for investigators to perform future studies in e-learning and other related educational disciplines.

Purpose of the Study

The purpose of the study is to determine whether significant differences exist among instructors from King Abdulaziz University's (KAU) Humanities and Scientific Colleges concerning their perceived levels of expertise and current use of e-learning technologies as part of their teaching. The proposed study will assess influential factors (motivational and barrier factors) as measured by a survey questionnaire. This study will examine these factors in terms of sex, years of teaching experience, and academic field.

Research Questions

The study addresses the following research questions:

The first set of questions:

1. What are instructors' perceived levels of technology expertise?
2. What is the current use of e-learning by the instructors of the King Abdulaziz University?

3. What are the intrinsic and extrinsic factors that motivate the instructors to use e-learning in their teaching?

4. What are the intrinsic and extrinsic factors that impede the instructors' use of e-learning in their teaching?

The second set of questions:

1- Is there a significant difference in the perceived technology expertise of instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC) ?

2- Is there a significant difference in the use of e-learning among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC)?

3- Is there a significant difference in motivational factors among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC)?

4- Is there a significant difference in barrier factors among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC)?

Hypotheses of the study

The following null hypotheses, based on the second set of the questions, will be answered. They are:

Ho1: There is no significant difference in the technology expertise of instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC).

Ho2: There is no significant difference in the use of e-learning by instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC).

Ho3: There is no significant difference in motivational factors among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC).

Ho4: There is no significant difference in barrier factors among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC).

Limitations

There are limitations to this study. Therefore, any results reported in this investigation may not be fully generalized to other studies and disciplines. These

limitations should be understood as recommendations of potential areas for further research. Limitations of this study include:

1. The study focuses only on instructors at (KAU) and does not include students, administrators, or support staff in the population.
2. The study was limited to (KAU) and results may not be able to be generalized for all other institutions of higher education.
3. The participants' responses on the survey may also not be clearly given or may have been given irresponsibly.
4. The study includes only current use, expertise, motivations, and barriers as dependent variables and three independent variables, including academic field, years of experience, and sex. The study does not consider all aspects of training or all possible psychological influences on behavior that might exist, such as all possible aspects of interest.

Definition of Terms

The following definitions were used to clarify and describe the terms upon which the discussion in this study was based. Definitions were also provided to establish the

intended meanings of terminology and to promote understanding for future replication of the study.

E-learning: defined e-learning as the delivery of content via all electronic media, including the Internet, intranets, extranets, satellite broadcast, audio/video tape, interactive TV, and CD-ROM(Urdan, 2000).

Expertise: expertise is a multifaceted phenomenon. To a large extent, it is a cognitive phenomenon, but it is not exclusively a cognitive one. Expertise involves both general and specific processes, as well as knowledge and the ability to organize it. Also, expertise consists of those characteristics, skills and knowledge of a person (that is, expert) or of a system, which distinguish experts from novices and less experienced people.

Expertise as Technical Skill: The definition of expertise derives from the specific tasks a professional must perform. Most professional programs teach specific skills; thus, expertise is not simply the knowledge of the existence of general principles. Instead, expertise is the ability to recognize the cases to which these principles apply (McGlothlin, 1960).

Motivation: The definition of (Smith, 1995) stating that motivation is "the inner stimulus that causes people to be energized and directed in their behavior"(Smith &

Luckasson, 1995,pp.241-295). According to (Vroom, 1964), the motivation of person to achieve a target is the belief that the performance and dealings will likely lead to a positive result. (Wolters, 1998) defined motivation as variables that stimulate or guide behavior in a specific path to achieve a target.

Intrinsic and Extrinsic Motivation: Intrinsic motivations come from inside an individual. For example, instructors may use e-learning because it is personally satisfying and enjoyable. In contrast, extrinsic motivations come from the environment around the person. For example, instructors are extrinsically motivated by increases in their salary or other rewards. As shown in Fig.1.2. Motivators can be positive or negative. Positive motivators encourage behavior and include benefits that exist. Negative motivators discourage behavior and include barriers as defined in the survey. For the purpose of this study, selected intrinsic and extrinsic variables, both positive and negative, are considered to be the form of motivation that has an effect on instructors' use of e-learning in their teaching.

Figure1.2: Intrinsic and Extrinsic Factors.

Organization of Study

This study consists of five chapters. The first chapter contains the introduction, background, statement of purpose, research questions, research hypotheses, significance of study, limitations of the study, and the organization. Chapter two provides a review of literature related to instructors' use of e-learning in their teaching as well as the factors that influence their usage. Chapter three deals with the methodology used to conduct the study. Chapter four contains the results and analysis of the study. Finally, chapter five contains the summary and discussion of the results and recommendations.

CHAPTER (II)

Review of the Literature

The objective of this chapter is to review previous literature and research relevant to this study. This includes examining the influencing factors on instructors' use of e-learning in delivering instruction. In addition, this includes mentioning variables and concepts of the study, which will include a general perspective on e-learning, motivational factors, relevant theories, and challenges and barriers that face instructors and institutions in the use of e-learning.

An Overview of E-Learning

Technological development is a major influence of change in the current environment. The significance of this development shows that an institution's lack of recognition of the strategic value of technology threatens the ability of this institution to survive the transition into the communication and Information Age (Rowley *et al.*, 1998). As an influence of change, technology has dramatically altered many processes and values in universities educational systems. (Armstrong, 2000) indicates that the rapidly developing achievements of technology, for both communication and learning, are inspiring organizational

evolution and cultural shifts. However, some academics may view distance learning as a disruptive technology. The methods of instruction, interaction, communication, support, and learning are developing rapidly based on technological advances (Jones, 2000). Within this rapidly developing environment of not only technology but also new learner needs and expectations, higher educational institutions are working to maintain traditional values and missions while developing as a union for an unobserved future.

Many people whether inside or outside education field still think that technology in classrooms represented by computers has been oversold and underused (Foster & Cass, 2002; Islam, 2002; Segers, 2002). Other studies indicate that most computer assisted learning software packages are not yet of commercial quality, and there are still many unanswered questions, especially concerning the application of modeling instructional situations realistically enough so that authoring tools for these situations can satisfy widespread demands (Murray, 1999). Some skeptics question the nature of successful technological and pedagogical advances for two reasons: technological thinking and social trends, or viewpoints (Espinosa *et al.*, 2005).

The first set of motives concerns technological thinking. Balancing computer science innovation with academic and teaching goals has been a particular problem for research and commercial groups that evaluate computer-assisted learning. Kuljis and Lees state that "whereas most research projects attempt to implement the most recent technological developments, commercial products seem to focus in providing efficient e-Learning solutions using already available solutions"(Kuljis & Lees, 2002). Thus, complex artificial intelligence developments can seem to provide no educational benefit in actual classroom situations; for example, the use of adaptive web content generators for e-learning. The pedagogical design of commercial products is often instructional and, thus, based on textbooks. This design occurs even in multimedia and virtual reality environments. (Espinosa et al., 2005) demonstrate that students do not always consult these online references and, instead, may prefer traditional content sources, such as photocopied materials from books and class notes in PowerPoint format. In addition, overused artificial intelligence or instructional software is not always the best solution for assisting learning, because people often learn with unpredictable methods that can be unseen by the technological developer(Heath, 1997). For

example, many people would rather chat than post items to a discussion board or use some other highly developed learning environment when working on a project over long distances, because it seems more ``personal'', and occurs in real-time (Espinosa et al., 2005).

The second set of motives is concerned with social sciences and humanities. Research in these fields has not been able to fully demonstrate that students are motivated to learn when the instructor applies the cognitive science theories of Piaget and Vygotsky in face-to-face activities (Cook et al., 2002; Wilson, 2001). Accordingly, the overall goal may become lost, and many instructors achieve few benefits from adopting these new strategies, as compared to the traditional way.

Many institutions have sought and secured web-based alternatives to their face-to-face courses. Higher education has gone through a huge transformation. Thompson (2000) states that there is "a rapid transition [occurring] from traditional approaches to education to forms of online delivery" (p. 154). Moreover, Davis states that "online learning is now becoming ubiquitous at all levels of education, in all institutions of learning, and in the workplace" (Davis, 2004). Despite all of the advantages that web-based learning offers for educational

institutions, their required capacity to supply a new technological platform have not improved without additional challenges and barriers. (Davis, 2004) explains that many of these challenges arise from the institutions' need to alter their whole infrastructures:

"Building the infrastructure for online learning requires that many factors be considered, so it is difficult to provide a straightforward checklist or recipe to follow. All educational endeavors are systems, made up of various interconnected components. In traditional universities and colleges, instructors can be unaware of all the complexities involved, but in distance education, understanding how the entire system of course development and delivery occurs, and how these systems link to services and other components, are vital aspects of ensuring effectiveness and quality." (pp. 97-98).

The intrinsic motivators may provide more incentive for instructors and students to incorporate technology in e-learning. (Lonsdale, 1993) outlines several general principles from motivation theory that concern instructors. He notes that in an academic environment intrinsic satisfaction is more effective in influencing motivation and performance than extrinsic factors. Additionally, (Taylor & White, 1991) found this to also be true in regard

to distance learning; instructors were motivated to teach in these distance e-learning programs more by intrinsic than extrinsic motivators.

Theories and Potential e-learning applications

Many forms of e-learning claim to be constructed from theoretical designs, such as constructivism, without explaining how these principles and values are embodied in the approach (Conole *et al.*, 2004). Thus, many designs are actually based on 'common-sense' rather than using a theoretically based construction. However, perhaps a more theoretically based approach to e-learning design would better relate theory with the intended features of learning and then connect appropriate tools and resources (both human and technical) with these features. This approach could enable practice to reflect the basic underlying theory.

There are many schools of educational thought and learning theories. Many theories can be divided into three educational categories: behaviourism, socio-cultural, and constructivism. In addition, many other models for learning have been suggested, including Jarvis' model of reflection and learning (Jarvis, 1987), Kolb's experiential learning cycle, this model is based on the studies of John Dewey,

Kurt Lewin, and Piaget (Kolb, 1984), Laurillard's conversational framework, which includes discursive, adaptive, interactive and reflective components (Laurillard, 2002) and Barnett's framework for higher education (Barnett, 1990). Each model has its own focal point and emphasis and is connected with a specific set of theoretical viewpoints. Therefore, each model has individual benefits that can be used to develop particular aspects of learning. With respect to e-learning, practitioners should be enabled to easily use the full range of available models or perspectives on learning, but there is currently little proof on how these models or theories can be applied to successful pedagogically driven e-learning (Conole et al., 2004). However, through refinement of the major characteristics within each of these different models or theories, it is clear that there is potential for a better implementation to e-learning activities. For example, Table (2.1) provides a review of some of the existing models and theories and outlines their major characteristics, the types of approaches they most clearly support and how they could be actualized in regards to of e-learning

Due to the fact that e-learning practitioners are not academics in the field of education, the diverse array of

theoretical applications and models that are available to them could seem foreign and overwhelming (McNaught & Oliver, 2003). Previous research has shown that the use of toolkits can provide a means for non-specialists to understand and implement such learning theories in a method that encourages careful creation, productive product analysis, and proper application (Oliver *et al.*, 2002). This table citation is taken from (Conole *et al.*, 2004).

Summary of key learning theories and models, their characteristics, and how they might be realized in the context of e-learning (Conole *et al.*, 2004) (See Table 2.1).

Table (2.1) shows several theories for learning. Some experts argue that these theories should serve as the basis for e-learning system development. Without a specific theory, these experts argue that the e-learning system does not have a solid foundation in educational theory. However, other experts argue that the educational theories can only serve the purpose of providing specific technological benefits rather than founding the entire e-learning process. These experts argue that if a specific educational theory is used for the basis of e-learning that this method could become outdated with developing technology. Instead, these experts encourage a fluid implementation that focuses on using theories for specific benefits rather than for the entire process as a whole.

Table 2.1 Theories and models for e-learning

Theories	Main characteristics	Potential e-learning applications	Literature
Behaviourism	<ul style="list-style-type: none"> • Focuses on behaviour modification via stimulus-response pairs • Trial and error learning • Learning through association and reinforcement • Pedagogical focus is on control and adaptive response • Focus on observable outcomes 	<ul style="list-style-type: none"> • Much of current e-learning development represents little more than transfer of didactic approaches online, the 'web page turning mentality' linked directly to assessment and feedback 	Skinner Tennant
Cognitive	<ul style="list-style-type: none"> • Focus on internal cognitive structures; views learning as transformations in these cognitive structures • Focus on human development • Pedagogical focus is on the processing and transmission of information through communication, explanation, recombination, contrast, inference and problem solving • Useful for designing sequences of conceptual material which build on existing information structures 	<ul style="list-style-type: none"> • Salomon's notion of distributed cognition (Salomon, 1993) could lead to a more shared knowledge structure between individual and surrounding information rich environment of resources and contacts • Development of intelligent and learning systems, and the notion of developmental personalized agents 	Anderson Wenger Hutchins Piaget
Constructivist	<ul style="list-style-type: none"> • Focus on the processes by which learners build their own mental structures when interacting with an environment • Pedagogical focus is task-orientated • Favour hands-on, self-directed activities orientated towards design and discovery • Useful for structured learning environments, such as simulated worlds; construction of conceptual structures through engagement in self-directed tasks 	<ul style="list-style-type: none"> • The concept of toolkits and other support systems which guide and inform users through a process of activities could be used to good effect to embed and enable constructivist principles • Access to resources and expertise offers the potential to develop more engaging and student-centered, active and authentic learning environments • Micro worlds and simulations 	Papert Duffy & Jonassen
Activity-based	<ul style="list-style-type: none"> • Focus on the structures of activities as historically constituted entities • Action through mediating artefacts within a framework of activity within a wider socio-cultural context of rules and community • Pedagogical focus is on bridging the gap between historical state of an activity and the developmental stage of a person with respect to that activity e.g. current state of language use and child's ability to speak a language • The Zone of Proximal Development – the idea that assessing current ability gives limited insight into an individual's potential for development, which is better studied through examining their work alongside a more able peer 	<ul style="list-style-type: none"> • In the last decade there has been a shift from a focus on the information (and in particular content) aspects of ICT to an emphasis on communication, collaboration and understanding the factors which underpin the development of communities • In particular there has been a realization that the development of content alone does not lead to more effective learning, and that there is a need to structure and foster learning environments to enable communities to develop • Networking capabilities of the web enable more diverse access to different forms of expertise and the potential for the development of different types of communities 	Vygotsky, '34; Wertsch, 85; Engestrom, '87

Table 2.1 (continued)

Theories	Main characteristics	Potential e-learning applications	Literature
Socially situated learning	<ul style="list-style-type: none"> • Take social interactions into account and learning as social participation • Emphasis on interpersonal relationships involving imitation and modeling • Language as a tool for learning • and the joint construction of knowledge • Language has two functions: <ol style="list-style-type: none"> 1. As a communicative or cultural tool, used for sharing and jointly developing knowledge 2. As a psychological tool for organizing our individual thoughts, for reasoning, planning, and reviewing our actions • Dialogue between tutor and student can be articulated into 12 levels of engagement – both external and internal • Knowledge is a matter of competences with respect to valued enterprise. Participating in the pursuit of this, i.e. active engagement • Meaning our ability to experience the world and our engagement with it as meaningful – is ultimately what learning is to produce 	<ul style="list-style-type: none"> • Multiple forms asynchronous and synchronous communication offer the potential for more diverse and richer forms of dialogue and interaction between students and tutors and amongst peers, as well as the use of archive materials and resource for vicarious forms of learning • Different online communication tools and learning environments and social for a offer the potential for new forms of communities of practice or facilities to support and enhance existing communities 	Mercer Vygotsky Laurillard Lave Wenger
Experiential	<ul style="list-style-type: none"> • Experience as foundation for learning • Learning as the transformation of experience into knowledge, skill, attitudes, values emotions • Reflection as a means of transforming experience • Problem base learning a focus: <ul style="list-style-type: none"> _ Experience: Problem situation, identification and definition _ Gather and reflecting on information _ Theory formation and test in practice. _ Experience through Primary and Secondary _ Reasoning and Reflection _ Evaluation (Dewey, 1916) 	<ul style="list-style-type: none"> • Asynchronous communication offers new forms of discourse which is not time-bound and hence offers increased opportunity for reflection • Archive and multiple forms of representation of different communications and experiences offer opportunities for reflection 	Dewey Kolb Jarvis
Systems theory	<ul style="list-style-type: none"> • Focus on organizational learning, or on modeling the development of learners in response to feedback 	<ul style="list-style-type: none"> • New forms of distribution and storage, archiving and retrieval offer the potential for development of shared knowledge banks across organisations and forms of organisational distributed cognition • Models of learning account adaptation in response to both discursive and active feedback 	Senge;Laurillard

Perhaps one of the most influential theories of learning for generating and testing a general theory of attitude-behavior connections is the theory of reasoned action (Choi et al., 2007). The theory assumes that individuals behave according to their conscious intentions, which are based on rational estimations of the possible results of the specific behavior. This theory is based on the idea that the belief of an individual is his subjective probability of the possible consequences for a given behavior. This belief of the individual influences his attitude, which shapes his behavioral intentions (Ajzen & Fishbein, 1980). This psychological information is included for future research, and this study does not focus on psychological influences on behavior as mentioned in the limitations section. However, in an e-learning environment, the attitude could be based on a general attitude towards e-learning in both a general and specific context.

Diffusion of Innovation

One of the most important methods for evaluating the adoption and use of new technology has been created through the use of diffusion research. In 1903 Gabriel Tarde created the S-shaped curve that is still the most important

method for analyzing the acceptance rate of new technological innovations. Rogers (1986) point out that:

"Tarde observed that the rate of adoption of a new idea usually In regards to: time: at first, only a few individuals adopt a new idea, then the rate of adoption spurts as a large number of individuals accept the innovation, and, finally, the adoption slackens as only a few individuals are left to adopt". (pp. 71-73)

This analysis is important for understanding the rate of acceptance for e-learning in institutions of higher education. This method of analysis focuses on aspects that influence everyone involved with the e-learning process, including students, instructors, administrators, and government officials. One of the leading theorists for diffusion research Rogers (1983a) identifies four major aspects in the diffusion process. Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system." (1983, p.10). This definition contains four major aspects that can be used to evaluate the process of innovation diffusion: innovation, communication channels, time, and social system.

Innovation is described "as an idea, practice, or object that is perceived as new by an individual" (Rogers,

1985). Rogers identifies five characteristics that are significantly correlated with the rate of adoption for innovations: relative advantage, compatibility, complexity, trial time, and observability. Rogers (1983b) notes that relative advantage is a good indicator of the rate of adoption for innovations in most cases. This category includes costs, investment returns, efficiency, and yield. Compatibility, the second characteristic, is the extent to which the needs as identified by the adopter are met by the specific innovation. The third characteristic, complexity, is considered to have a negative correlation with the rate of adoption. If the innovation is found to be too difficult to understand or use for the potential adopter, this innovation is less likely to be adopted. Trial time is the fourth characteristic and is the opposite of complexity because it allows the individual time to have a phased-in approach where they can experiment with and developing understanding for the innovation. The last innovation characteristic, observability, reveals that innovations which produce tangible results are more likely to be adopted.

The second aspect for evaluation the process of innovation diffusion is the communication channels that exist and develop. Communication channels develop with

diffusion to provide a method for transferring information about the innovation between individuals. Rogers (1986) identifies two types of communication channels: mass media and interpersonal channels. The two channels differ in their methods of information transmission. Mass media uses distribution methods that might reach a larger audience. Interpersonal communication channels form between two individuals sharing information and includes individuals who are either homophilous, having similar values in certain characteristics (such as educational level or social status), or heterophilous, having different values in these characteristics. Rogers indicates that two homophilous individuals are more likely to have greater effects on the transmission of knowledge, formation of attitudes, and behavioral changes related to a new innovation due to the fact that they share similar values relating to their work and home environments. Heterophilous individuals, in contrast, have a greater potential for creating problems in the diffusion of innovations than their homophilous counterparts because their communication style may create intellectual dissonance based on the differences in their backgrounds and values.

Time is the third aspect in Roger's analysis of diffusion and includes three different measurements: the

innovation-decision process that allows an individual encountering new knowledge to either adopt it or reject it, the innovativeness of an adoption that is defined by the date when the decision for adoption occurs, and the number of people that adopt the intended innovation.

The last aspect for the diffusion of an innovation as defined by Rogers is the social system. Rogers (1995) identifies three ways that innovation decisions occur within a given social system: optionally, collectively, and through authority. Optional decisions are made by individuals without external influence. Collective decisions are based on the consensus of the given group. Finally, Decisions made through authority are created by individuals with technical expertise or power within the given group.

Motivation and Benefits of E-learning

The growing importance of e-learning technology has caused a perspective that views the implementation of e-learning in institutions of higher education as beneficial. On the other hand, implementing e-learning is failing in many situations because there is a lack of sufficient planning, policies, and strategies to manage this integration (Flowers, 2004). This lack of proper

policies and strategies causes the quality, learning experience, and benefits of the students, instructors, and institutions to suffer.

If the policies of the institution are appropriate and well received, then an environment of success can develop. This environment can foster a more successful integration, instruction, and evolution towards e-learning technologies (Broadbent, 2000).

To encourage institutions of higher education to transition into e-learning, significant benefits must be provided by the new technology (Simmons, 2002). Benefits can exist for both students and instructors. For example, tutoring can occur at anytime from any location. Also, materials that exist online can be updated and viewed in real time: students can see modifications as soon as the instructor makes them. When the online materials are created properly, online learning systems can be used to evaluate students' needs and current expertise level as well as to assign proper materials for students to incorporate to attain the intended e-learning results.

Academic programs that are delivered with e-learning also provide many benefits for instructors, students, and academic administrators. The interaction between instructor and student increases in an online environment as well as

the ability to communicate with a larger number of students, creating an increase in globalization and diversification(National Education Association, 2000). Another potential benefit that exists is the fact that the needs of non-traditional students, who often maintain responsibilities like careers and families which prevent them from enrolling in traditional college courses during the daytime, can be used arrange their e-learning time around their existing schedules. Also, there are other students who may simply prefer learning in an e-learning environment. Moreover, as financial support from the state decreases in public higher education institutions, e-learning allows a new audience of pupils as well as a new source of revenue for the institution without additional requirement of traditional on-campus facilities like classroom space and hall buildings.

Previous Studies

Several studies have examined the factors that influence instructors to participate in and use e-learning technologies in their delivery of instruction. Perhaps the most important of these studies for the purpose of this current research are (Meyers, 2000a),study of the factors

that motivate and impede instructors in the use of computers.

Meyers' study focuses on the personal needs of individuals that can motivate computer use, significant differences between the instructors' years of experience ("new", "experienced", and "senior") and the factors that could motivate computer use, and significant differences that could exist between these instructors with differing experience and their personal needs that motivate them to use a computer. The study uses descriptive and ex post facto research designs to analyze that data of two hundred forty-eight participants (a 66 percent return rate for the given questionnaire).

This study has six major findings that show the correlation between motivations and barriers to computer use. The first finding indicates that when "a computer is located in the classroom" the instructor is motivated to use this computer. This finding relates to the belief that accessibility can be an important motivator for encouraging the adoption of technology. "Release time" is the second finding that is also mentioned as a motivator for computer use and relates to the aspect of trial time in Roger's theory of innovation diffusion. Correspondingly, "lack of time" is also mentioned as a barrier that impeded computer

use. The third finding, seen in 99 percent of 244 respondents, shows that the ability to use a computer is an essential skill for the twenty-first century. This finding relates to the relative advantage of the innovation in Roger's theory of innovation diffusion. The fourth finding is based on Maslow's Hierarchy of Needs Theory and indicates that instructors were motivated by higher order needs of belonging, esteem, and self-actualization. The fifth finding shows that "senior" instructors with over 15 years of experience were significantly higher in agreement that they are able to receive help with computer technology when they needed it than the "new" instructors with one to eight years of teaching experience. The final finding shows that the "new" instructors were more motivated to share their computer expertise with others and enjoyed recognition for using computers. The motivations and barriers shown in this study relate specifically to computer use, but these same motivations and barriers may be significant for the adoption of all new e-learning technologies.

Another study that shows the effect of motivations and barriers on e-learning application, is the study that Betts (1998) conducted on the factors that motivate instructors' participation in e-learning. This study focuses on the

intrinsic motivators, extrinsic motivators, and barriers for instructors of e-learning courses, instructors of face-to-face courses, and academic administrators. The study aimed at identifying factors that could motivate instructors of e-learning as well as face-to-face courses to teach e-learning courses. The study also focused on potential factors that served as barriers and impeded each group's participation in e-learning as well as significant differences in viewpoints that existed between course instructors and academic administrators, deans in particular. Betts's study reveals that the primary motivators as indicated by the participants' already using e-learning were intrinsic and mainly focused on attaining self fulfillment. In addition, Betts states that intrinsic factors created positive influence for instructors in Distance Education, but extrinsic factors showed no significant influence.

Meyers (2000) dissertation also shows that there are factors, such as motivations and barriers, which affect the instructors' implementation of technology in the classroom, specifically computers. Meyers found that instructors have been somewhat unwilling to incorporate computers into the classroom, but this reluctance to adopt computer technology could be the result of insufficient motivation and support

for the instructors to make this transition. This study only focuses on the specific use of computer technology, but the implications that are established by this study could be significant for understanding the intrinsic and extrinsic factors that influence the adoption and integration of any e-learning technology.

Another study by Maguire (2005) compares the findings of previous researchers in e-learning technology in terms of many factors, including intrinsic and extrinsic barriers and motivations. The intrinsic barriers included competition from private and public institutions, career and job security concerns, intimidation by technology, lack of understanding of Distance Education and what will work at a distance, and resistance to innovation. The extrinsic barriers for the instructor are included as institutional barriers and include concerns about faculty workload; lack of administrative support; lack of collegial support; security concerns; lack of grants for materials, expenses, design & development; lack of knowledge of where to go for assistance; lack of merit pay or monetary support; lack of release time; lack of technical support; lack of systems reliability; lack of training; developing effective technology skills; difficulty in recruiting faculty; inadequate hardware and software; inadequate

infrastructure; slow action on critical issues; weak communication; time taken away from research; and lack of time to develop and maintain course material. The intrinsic motivations include optimal working conditions, overall job satisfaction, personal motivation to use technology, self-gratification, intellectual challenge, and desire to get students more involved with technology. The extrinsic motivations include role modeling and peer observation as well as collegial support and recognition. The extrinsic motivations for the instructors also include institutional factors such as administrative encouragement and support, credit towards tenure and promotion, recognition of work, training in how to effectively teach online, increase in salary, and instructional design and development support. This study shows the findings of previous studies on e-learning adoption and integration in terms of these intrinsic and extrinsic motivations and barriers. Likewise, the current study will also try to examine intrinsic and extrinsic motivations and barriers.

Some of the barriers to e-learning have been solved through technological evolutions and increased budgets for this technology, but other barriers are still dependent on the instructors themselves. Choi et al.(2007) note that "Whilst the importance of end-user training is recognized as

a factor in the success of information systems, companies have suffered from relatively low information system training budgets and an insufficient number of trainers. However, technological innovations in computers, telecommunications and the Internet, e-learning have made it possible to overcome many constraints". (pp.223-243)

This analysis shows that while the budget and instructors may be insufficient, the development of technology has made it possible to bypass these situations and still be able to focus on the information systems. There are many important factors that determine the success of implementing technology in education. Instructors are one of these factors. Webster & Hackley (1997) identify that three instructor characteristics exist which strongly affect the outcomes of the learning: teaching style, control of technology, and attitude towards technology. Collis (1995) indicates that the instructor plays a crucial role in effecting success for the learners through the effectiveness of the e-learning delivery. For Collis, the instructor's ability to implement technology, rather than the technology itself, determines the significance of the learning. In addition, Webster and Hackley support the notion that students will have a more positive learning experience if instructed by an instructor with a positive

attitude towards technology and e-learning techniques: a perspective consistent with (Fulk *et al.*, 1990) social influence model of technology. Moreover, Fulk (1993) notes that supervisor, co-worker and work group are examples of social influence that affect either positively or negatively the attitudes toward technology in this mode. Social constructivist theories maintain that members of an organization are working on developing coordinated patterns of behavior with one another based on personal observations of the behaviors of other members, the consequences of observed behaviors, and emotional reactions of the members. Fulk's research (1993) on the social influence model has also stated that user's attitudes toward e-mail are influenced by colleagues and managers in place work. Moreover, there are numerous factors which act as barriers and explain the differences among instructors' attitudes toward the implementation of technology: frustration with technical problems, frustration with physical limitations such as those placed on the instructor by digital web cameras during instruction, lack of preparation to teach with the technology, and a lack of motivations for implementing e-learning.

A study of instructors and their use of e-learning in Hong Kong by So & Swatman (2006) have also indicated that

gender may provide an important factor for influencing instructor motivation and use of e-learning technology. This study used a pilot survey to assess the preparedness of Hong Kong instructors for e-learning. Significant differences in preparedness were observed between male and female instructors. Differences observed between genders can be controversial, and some researchers have not observed any differences between male and female instructors. However, this study shows a significant difference in the responses of the male and female instructors in regards to their confidence despite the fact that both groups received equal training with males showing more positive responses. Additional differences were observed in regards to team/group work cultures, and females responded more positively to this type of work environment. The results of this study appear to indicate that the construction of professional e-learning development for instructors should consider gender and include the particular requirements of female instructors in this implementation.

Another study by Qing (2006) in Canada also indicates these same differences between the genders and further investigates the increased confidence of male instructors. This study also shows the female preference for team/group

work culture and supports the notion that e-learning incorporation should include this type of environment to foster acceptance of the technology by female instructors. As far as male confidence is concerned, this study shows a significant difference in the responses between the genders in relation to the enjoyment of e-learning technology. Perhaps this enjoyment creates an intrinsic motivation that encourages the confidence of the male instructors. While the results of these studies should not be ignored, other studies have not shown any significant differences between genders in relation to e-learning technology.

For example, a study by Koohang (2004) at the University of Wisconsin-Milwaukee examined the perceptions of users of e-learning technology. This study compared the results based on many factors including gender. The study found that there was no significant difference in the results based on gender. This finding is contrary to the previous two studies that focused on the importance of this gender difference. Thus, it is not conclusive whether there is a significant difference between genders in regards to e-learning technology, but this potential factor should not be ignored in an analysis of the results.

The cultural background of the studies may also influence the results. The fact that this research is being

conducted in Saudi Arabia could perhaps have a significant influence on the results based on gender. However, this result is yet to be determined.

Expertise could also be an influential factor in the adoption and use of e-learning technology. Lane & Yamashiro (2006) conducted a survey to evaluate the influence of various variables, including expertise, on e-learning incorporation. The study examined both general expertise and specific expertise in certain areas of technology in terms of beginner, intermediate, advanced, and expert ratings. The researchers found that these factors could be important for the adoption and use of e-learning technology. In addition, the researchers compared these findings against other variables, including gender, and concluded that gender may influence perceived level of expertise. Due to the significance of these findings, expertise is being used as a variable for the purposes of this study in order to understand how instructors' perceptions of themselves and their abilities could influence their adoption and use of e-learning technology.

The Challenges and Barriers of E-Learning

The development of digital technologies in education has changed the academic experience for both instructors

and students. Both groups have had to adapt with the evolution of the institutional support process. The preparation for a course in light of digital technology development may require the students and instructors to learn a new software application that can deliver a concept more effectively than previous methods. The students may reveal their learning efforts through text, audio, or video for instructor evaluation. Furthermore, instructors and institutions are then faced with a wide range of challenges and needs as they engage in e-learning (Levine & Sun, 2002); Arabasz et al., 2003).

Institutional challenges and barriers:

Higher education faces several challenges and barriers in the area of e-learning. In addition, Information and Communications Technologies allow higher educational institutions to have a potentially wider audience than before. However, in addition to the promised benefits of e-learning and technological development, there are still significant barriers remaining both inside and outside the higher educational institutions. Levine & Sun (2002) identify a number of barriers that must be dealt with in order to efficiently incorporate e-learning programs and

divide these barriers into two categories: internal and external.

The internal barriers consist of pedagogical challenges, funding difficulties, and the slow pace of implementation of changes in governance. One of the most significant barriers facing institutions of higher education is the lack of professional development for faculty members. Most institutions of higher education do not educate graduate students on teaching styles or methods, and most do not require the instructors to possess teaching licenses. Previously, instructors have developed their teaching styles based on their own experience as students. This development has focused on face-to-face lectures, which are traditionally the most prevalent method of instruction in higher education. However, in order to achieve significant results in e-learning programs, instructors should understand that alternative methods of teaching may be more appropriate for this kind of technology driven learning. Levine & Sun (2002) insist that instructors have to change their teaching styles to focus on coaching, discussions, and more opportunities for student-instructor interaction.

This focal shift in pedagogy to "anytime, any place learning" brings up instructors' concerns about their new

role in the learning process as well as their new, increased workload. This new, increased workload can be seen in the creation of courses, maintenance of chat rooms, and response time to emails from students. All of these increased elements of the instructors' workload require more time and energy from the instructor than traditional courses (Levine & Sun, 2002). Time is considered an administrative issue due to the institution's ability to allow release time for the instructors to develop and maintain e-learning courses. Lack of release time would also be a barrier for instructor participation in e-learning (Betts, 1998). In addition, instructors sometimes feel as if the time used on course development by itself takes time that could be spent on research (Rockwell *et al.*, 1999) . Furthermore, the lack of recognition for e-learning instructors is an additional barrier that can exist from the institution. The time that an instructor devotes to teaching or developing e-learning courses is not as highly valued by some institutions as the time being spent on research or even teaching traditional face-to-face classroom courses (Maguire, 2005).

Another internal challenge confronting institutions of higher education is availability of funding. Due to financial problems, institutions are continually struggling

to find sufficient resources to fund stipends, provide release time, purchase and maintain equipment, and hire support staff (Levine & Sun, 2002). The lack of technical support is a significant barrier created by the administration of the institution (Berge, 1998). This lack of technical support consists of the lack of system reliability and access to e-learning course software as well as the insufficient infrastructure, hardware, and software technology.

The final internal challenge is the slow implementation of governance and policy issues through traditional channels that cannot evolve quickly enough to meet the needs of e-learning programs. This lack of modern governance methods results in the rise of private competitors which provide e-learning programs, such as the University of Phoenix , DeVry Institutes, and Capella University. The private competitors influence the development of e-learning programs and, in effect, take control of the current curriculum away from the traditional institutions of higher education.

External barriers to e-learning implementation are also significant. Debates exist between instructors and institutional administrators on whether the scholarly works of instructors belong to the individuals themselves or to

the institutions in which they work. Many instructors argue that e-learning course materials should be their own personal property. These instructors rely on the academy's traditional practice of allowing professors to retain personal rights to the materials that they develop. However, some institutions counter this argument by claiming that the institution itself provides the time, money, and resources that are used in e-learning. Thus, the institutions consider the e-learning product to be a "work made for hire" and, therefore, the property of the institutions. Moreover, e-learning programs have raised concerns about the proper use of online materials that are copyrighted. In order to deal with these multiple external barriers, instructors and institutions need to maintain mutually acceptable policies and procedures that allow for the institution's use of materials and, at the same time, motivate instructors to become personally involved in the e-learning process.

Instructor challenges:

Some experts examine the motivational factors that influence the use of e-learning technology. Maguire (2005) examines the fact that, in addition to the personal factors that can encourage an instructor's use e-learning, barriers

also exist that can deter the instructor from teaching through e-learning. These barriers are less frequent than positively motivating factors because they are more extrinsically based than intrinsically based. There are some intrinsically based barriers that do impede an instructor's use of e-learning technology such as resistance to changes and intimidation from technology (Parisot, 1997; Berge, 1998). In addition, Berge (1998) explains the barrier that exists with resistance to changes: many instructors indicated a reluctance or inability to handle the changes created by online teaching. These reluctant instructors usually have not incorporated much technology into their traditional face-to-face classroom courses, and some have even found ways to avoid using email. Thus, for these instructors, the idea of instructing an entire course in an e-learning environment is an intimidating consideration.

One intimidation from technology that could impede an instructor's use of e-learning regards their understanding of e-learning and what types of courses are most appropriate for this forum (Berge, 1998). Instructors are also concerned with the fact that they are dependent on developers and programmers, and many are concerned about security issues (Maguire, 2005). Other instructors feel

personally intimidated by the increasing technology, and these instructors are concerned that e-learning courses and programs will take the place of the traditional on-campus learning experience (Maguire, 2005). These instructors worry about their own job security based on the technological evolutions occurring in their field (Dooley & Murphrey, 2000). In addition, some instructors are concerned that "capturing their intellectual property through multimedia might eliminate positions" (Dooley & Murphrey, 2000).

Another barrier for the instructor that is based on intimidation is the fear of competition. Some instructors are intimidated by the thought that e-learning creates a virtual classroom and allows students to take courses from one or more institutions. Thus, students will select courses at institutions that will provide them with the education that they desire to meet their needs. Some instructors from traditional institutions of higher education fear the increased competition from other e-learning courses and programs (Dooley & Murphrey, 2000).

The amount of time that is required to develop and maintain e-learning courses compared to traditional courses represents a significant barrier for instructors (Arabasz et al., 2003). In e-learning environments, the instructors

should have sufficient time to reanalyze, reformat, and redesign the course to adapt it for e-learning delivery; attend technical and pedagogical instruction; and communicate with and offer feedback to students in their teaching (Arabasz et al., 2003).

Technicality is another challenge facing e-learning instructors. Instructors need to not only prepare the class itself but also develop contingency plans in the event of technical problems in the future (Arabasz et al., 2003). Furthermore, the instructor should bear the students' technical limitations, such as hardware and software of computer, bandwidth, and networks, in mind when developing the course. Thus, when instructors are designing an e-learning activity, they could include multimedia elements or complex web pages in the course material, but the students may not know how to use these elements effectively or be able to use them at all (Arabasz et al., 2003).

One of the barriers to the implementation of e-learning is the lack of instructor interest in adopting the new technology. Not every instructor is willing to adopt e-learning, or other related technologies, into their teaching style (Arabasz et al., 2003). The fundamental personal beliefs about education that instructors bring to the educational process determine how they evaluate the use

of technology and e-learning strategies (Cuban, 1986). Not all experts agree that the inclusion of new information and communication technologies is panacea and positive within educational environments and organization. Postman (1995) cautions against the many dangers he sees in placing too much confidence in the "god of technology" (p. 47). Postman (1995) states that new technology can be helpful for teaching facts, but it is against the development of social values. He indicates that many of the problems in the current and future school systems cannot be solved simply by using new hardware technology (Postman, 1995).

Summary

In conclusion, technology presents new and developing challenges for all levels of education from instructor to student to administrator to government representative. Much of the existing literature has examined the relationship between intrinsic and extrinsic motivations and barriers that influence the use of technology for educational purposes. This research has shown strong connections between motivation, particularly intrinsic, for encouraging instructors to implement technology in their courses and classrooms. In addition, the research has shown the

negative impact of challenges and barriers to the implementation of technology.

The implementation of e-learning technology is crucial for modern institutes of higher education because of the growing importance and development of technology in general; however, the problems and benefits that are associated with implementing this developing technology should be closely examined in order to understand the exact nature of this technological evolution for the purposes of education. This study will focus on the relationship between different types of positive and negative motivations, both intrinsic and extrinsic, as well as other challenges that affect the use of e-learning in a Saudi Arabia institution of higher education.

CHAPTER (III)

Methodology

This chapter focused on the research methods utilized in the study. It addressed the research questions, instrument development procedures, research procedures, a description of the study sample, a discussion of the instrumentation employed to answer the research questions, the pilot study, and the description of the data analysis.

Research Questions

The purpose of the quantitative study was to determine whether significant differences exist among instructors from King Abdulaziz University's (KAU) Humanities and Scientific Colleges concerning their use of e-learning technologies as measured by a survey questionnaire. Specifically, the study addressed the following research questions:

The first set of questions:

- 1- What are instructors' perceived levels of technology expertise?
- 2- What is the current use of e-learning by the instructors of the King Abdulaziz University?

3- What are the intrinsic and extrinsic factors that motivate the instructors to use e-learning in their teaching?

4- What are the intrinsic and extrinsic factors that impede the instructors to use of e-learning in their teaching?

The second set of questions:

1- Is there a significant difference in the perceived technology expertise of instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC) ?

2- Is there a significant difference in the use of e-learning among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC)?

3- Is there a significant difference in motivational factors among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC)?

4- Is there a significant difference in barrier factors among instructors based on main effect (A)

sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC)?

These questions establish the variables that are to be used in this study. There are three independent (sex, academic field, and years of teaching experience) and four dependent variables (motivations, barriers, current use, and expertise). The following illustrations (Fig 3.1 & Fig 3.2) demonstrate the relationships among each of the four dependent variables with the three independent variables.

Fig 3.1: Two dependent variables with three independent variables

Fig 3.2: Two dependent variables with three independent variables

Hypotheses of the study

The following null hypotheses, based on the second set of the questions, were examined. They are:

Ho1: There is no significant difference in the technology expertise of instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC).

Ho2: There is no significant difference in the use of e-learning by instructors based on main effect (A) sex, (B)

academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC).

Ho3: There is no significant difference in motivational factors among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC).

Ho4: There is no significant difference in barrier factors among instructors based on main effect (A) sex, (B) academic field, (C) teaching experience, and Interaction (AB, AC, BC, ABC).

The population

The population of the study consisted roughly of 2000 instructors of the King Abdulaziz University (KAU) in Saudi Arabia, during the academic year 2007-2008. These included both the separate men's and women's sections at the one campus in Jeddah. KAU is one of the largest and official universities in Saudi Arabia, and it has a wide range of academic areas. It was chosen as the site of the study because it is involved in implementing e-learning techniques. Also, as it has larger size, several studies of organizations and innovation adoption have operationalized size in such terms as the number of employees and the size of the population served. Findings, therefore, differ

partly due to definitions. Rogers (1995) saw size as a probable surrogate measure of other dimensions leading to innovation, among them total resources, technical expertise of employees, and organizational structure (p. 379). He further suggested, as most researchers have consistently found, that larger organizations are more innovative. Brace & Roberts (1996) found similar results to Rogers. They indicate that a larger institution is more willing to incorporate modern technology. They also indicate that physical resource support is essential for the spread and acceptance of this technology. These larger institutions usually have a larger physical resource support and are able to incorporate this new technology more readily.

Selection of the Sample

The sample was selected at random from instructors in the male and female sections of the humanities and science colleges at KAU. The research was conducted with cluster sampling in order to have a proper selection that represented the instructors in the two academic fields. These two fields have been chosen in order to hopefully provide an appropriate sample size to represent instructors at KAU.

Instrumentation

Development of Instrumentation for this study relied on structured instruments (see Appendix A for English version and Appendix B for the Arabic version) that consist of three parts (see Figure 3.3). These instruments were developed for this study to investigate the factors that may influence instructors' use of e-learning technologies in their teaching. These instruments were based on a review of literature in the field, particularly Ishtaiwa (2006) and Medlin (2001).

Figure 3.3: Instrumentation of the Study

The survey questionnaire consists of three major parts: (1) demographic information, (2) individual e-learning knowledge (expertise) and use, and (3) intrinsic and extrinsic factors that influence the use of e-learning techniques.

The first part includes demographic information. The demographic information consists of three items that seek individual personal information of the participants and is divided into these variables: sex, academic field, and years of teaching experience.

The second part includes two scales designed by the researcher based on a review of the literature, in particular Ishtaiwa's (2006) study on the Factors Influencing Faculty Participation in E-Learning and Medlin (2001) study on the factors that may influence a faculty member's decision to adopt electronic technologies in instruction, for measuring instructors' general and specific expertise and current use of e-learning. The first scale consists of 12 items regarding expertise. These include using a word processor to create documents, using a spreadsheet to create charts and graphs, using a computer to find resources from the university library, searching the web to find information and resources, using database software to set up and access information, using

presentation software (e.g., PowerPoint), using graphic software to create illustrations, slides, or images, using audio/video clips software to create or enhance presentations, website design, using a computer to communicate with others , using of electronic bulletin board, and using video conferencing.

The instrument employed a Likert-like scale to elicit participants' responses related to their current expertise with each type of e-learning technologies. A five point Likert-like scale was used: Don't use = 0, Novice = 1, Intermediate = 2, Proficient = 3, Expert = 4.

The second scale consists of 15 items regarding current use of e-learning as the frequency of the types of technology used. This scale was partially based on Ishtaiwa's (2006) study and Medlin's (2001) study. It includes use of computer software for handouts or lecture notes, used email as the primary source of student contact outside the classroom, holding virtual office hours, created and used an on-line syllabus with hyperlinks to class resources, use on-line bulletin board, used personally designed Web-based lectures, notes, or tutorials, used personally designed web-based tests or quizzes, provided web-based grades, used Internet research and searches, posting required readings on course web page,

use on-line chat room , commenting on course work electronically, electronics conferencing, use video tapes for instruction, and use audio tapes for instruction.

The instrument employed a Likert-like scale to obtain participants' responses related to questions describing the frequency and type of e-learning technologies used. A five point Likert-like scale was used: 0 =Never (0%), 1=Seldom (1-25%), 2 = occasionally (26-50%), 3 = Often (51-75%), 4 = Almost all the time (76-100%).

Finally, the third part includes two scales for measuring intrinsic and extrinsic factors that influence instructors' use of e-learning. The first scale consists of 23 items to examine which factors motivate instructors to use e-learning in their teaching. It includes requirement by department or university, administrative encouragement and support, technical support in solving computer problems, support and encouragement from peers, access to software tools for enhancing teaching with technology, credit toward promotion and tenure, professional prestige and status, training programs and support, reduced teaching load, opportunity to improve teaching, rewards/recognition for innovation in teaching, time available to learn/pursue the integration of e-learning technologies, increase in salary, opportunity to reach new audience that can not

attend classes on campus, opportunity for scholarly pursuit, funding for materials/expenses, classroom technology infrastructure (e.g., wiring , computers, or projectors), resources about how to apply technology in teaching, student' access to resources, student' computer skills, my computer skills, my colleagues' computer skills, and opportunity to enhance communication with others.

The instrument employed a Likert-like scales to obtain participants' responses related to questions describing the factors that motivate one to use e-learning technologies in instruction. A five point Likert-like scale was used: Highly Discouraging (HD) = 0, Discouraging (D) = 1, Not a Factor (NF) = 2, Encouraging (E) = 3, Highly Encouraging (HE) = 4.

The second scale consists of 18 items which examine factors inhibiting instructors' use of e-learning in their teaching. It includes lack of interest, lack of time to learn a new technology and contacting students via email, negative comments made by colleagues about e-learning technologies, lack of support and encouragement from administrative, lack of support and encouragement from peers, lack of instructors' technological knowledge, lack of students' technological knowledge, lack of training programs, lack of face-to-face interaction in e-learning

courses, lack of credit toward promotion and tenure, lack of funding for materials/expenses, lack of rewards/recognition for innovation in teaching, concern about course quality, lack of technical support in solving computer problems, lack of technological infrastructure, lack of Student' access to resources, lack of resources about how to apply technology in teaching, and security concerns.

The instrument employed a Likert-like scale to obtain participants' responses related to questions describing the factors that impede use e-learning technologies in instruction. A five point Likert-like scale was used: 0 = No barriers (NB), 1 = Very few barriers (VFB), 2 = Few barriers (FB), 3 = some barriers (SB), 4 = Many barriers (MB).

Validity and Reliability of the Instrument

Validity refers to the "defensibility of the inferences researchers make from the data collected through the use of an instrument" and reliability of an instrument is "one that gives consistent results" (Fraenkel & Wallen, 2000).

The survey questionnaire was validated in two stages. In stage one, the questionnaire was submitted to a panel of

experts in the Department of Curriculum and Instruction, Research Center, and Educational Technology at West Virginia University (WVU). Experts were asked to judge the items for their adequacy to measure the level of the current use of e-learning technologies by instructors in their teaching , level of current expertise, and factors that influence instructors use of e-learning.

The panel of experts also was asked to assess (1) the clarity in the directions and the question, (2) the appropriateness of the variables that corresponded with the Likert-like scale, (3) the continuity across sections, (4) the amount of time needed to complete the questionnaire, and (5) to recommend additions or deletions of items and variables to the questionnaire. These requests were informed by suggestions made by Betts (1998) about designing and validating survey instruments.

Based on the first stage of validation, and comments and suggestions from the panel of experts at WVU, minor changes were made to the survey to make it more understandable.

In the second stage of the validation, the survey was translated into Arabic by the researcher. The rationale for translating the survey into Arabic is to make sure that participants understand all the survey items and to assure

the validity of the finding. Also, the Arabic language is the first language of the participants. The Arabic version was reviewed by two instructors of the Arabic language program at the University of Texas at Austin holding PhD degrees and one instructor of Arabic language from Saudi Arabia holding a master's degree in Arabic. Based on the comments of the reviewers, a few minor changes were made to the translation.

Pilot study

The reliability of the survey questionnaire was examined in two stages. In the first stage, the researcher obtained permission from President of King Faisal University (KFU) to conduct the pilot study test of the questionnaire. KFU has 14 colleges and is an official higher education institution. KFU was selected to be the site of the pilot test of the questionnaire because it is another university that offers some e-learning courses and has a similar educational system and size as King Abdulaziz University (KAU). In the second stage, the researcher piloted the Arabic version of the survey and evaluation form at King Faisal University (KFU) during the fall 2008 semester. There are 50 instructors that participated in the pilot study.

The pilot test was given the proposed evaluation form (see Appendix C) and questionnaire. Evaluation instructions were included on the questionnaire. Participants were asked to note areas of difficulty, confusing, or misleading on the questionnaire as they were completing it. The participants were asked to return the completed questionnaire within one week.

The pilot study was able to provide information concerning ambiguities within the questionnaire, thus dealing with the issue of content validity, reliability, and understandability.

In the third stage, after collection of the survey, the statistical reliability of the survey was assessed using Cronbach's alpha coefficient of internal consistency. The analyses were calculated for the entire questionnaire, as well as for part two and three separately (See Table 3.1). These analyses produced a Cronbach's alpha value (0.944) for part two , (0.941) for part three, and (0.946) for the entire survey.

Table 3.1: Reliability of questionnaire

Reliability of Section Two		Reliability of Section Three		Reliability of Entire Survey	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
.941	27	.944	41	.946	73

According to (Kerlinger, 1964; Davis, 2000; Muijs, 2004), this instrument has a very high value of coefficient alpha (See Appendix D). Based on the results of the pilot study and the comments from participants, some changes have been made to the instrument to be used in this study.

Data Collection

The data were collected from two of the fourteen colleges at KAU, the humanities and the science colleges. Each of these colleges has separate male and female sections and surveys will be given to both sections for each of the respective colleges. The participants were selected at random and provided with a paper survey or the address for a website where they could complete the survey electronically. In addition, the main web pages for each of the colleges featured a link to this same website in order to allow more instructors to participate in the survey. The paper surveys were returned to a collection box that was available to the instructors, and the electronic surveys were collected from the website. After three weeks, the colleges were sent a letter from the Center for Research to remind them to return the completed surveys that they had received. Four independent data collectors were used to collect the surveys from the instructors. These measures

were designed to provide a high response rate for the survey.

Procedures for the Analysis of Data

The analysis of data in this study included three statistical techniques, factor analysis, descriptive statistics, and inferential statistics. The researcher coded and entered data into a database using the Statistical Package for the Social Sciences (SPSS).

The design of the study included two sets of study questions. Also, it had four dependent variables and three independent variables. The dependent variables included level of current expertise, level of current use, motivational factors, and barrier factors. The independent variables included academic field, years of teaching experience, and sex (see Figure 3.4).

The objective of the study was to answer the study's questions. To answer the first study questions, the researcher used descriptive statistics including means, standard deviations, ranges, frequencies, percentages, and diagrams.

Inferential analysis techniques, including three-way factorial ANOVA (A x B x C Factorial Design), and Scheffe's

post hoc analysis were used to answer the second set of study questions.

Figure 3.4: Three independent Variables and four dependent Variables.

In particular, a three-way factorial ANOVA was employed to determine whether significant differences exist among instructors from King Abdulaziz University's (KAU) Humanities and Scientific Colleges concerning their use of e-learning technologies based on the three independent

variables of (A)sex , (B)academic field, and (C)years of teaching experience.

The factor analysis procedure initially was used to develop the questionnaire and give more insight about the variables of the study. That is, to explore and explain relationships among the study variables in order to discover if these variables can be grouped into a smaller set of underlying factors. The following (Table 3.2) presents the relationship between the first set of research questions with survey items. (Table 3.3) presents the relationship between the second set of research questions with survey items

Table 3.2: First set of research questions

First Set of Questions		Survey Items
1	What are instructors' perceived levels of technology expertise?	Part II of the Survey, Table 1 - 12 items
2	What is the current use of e-learning by the instructors?	Part II of the Survey, Table 2 - 15 items
3	What are the intrinsic and extrinsic factors that motivate the instructors to use e-learning in their teaching?	Part III of the Survey, Table 1 - 23 items
4	What are the intrinsic and extrinsic factors that impede the instructors to use of e-learning in their teaching?	Part III of the Survey, Table 2 - 18 items

Table 3. 3: Second set of research questions

Second Set of Questions		Survey Items
1	Is there a significant difference in the perceived technology expertise of instructors based on their academic field, teaching experience, and sex?	Part II of the Survey, Table 1 - 12 items
2	Is there a significant difference in the use of e-learning among instructors based on their academic field, teaching experience, and sex?	Part II of the Survey, Table 2 - 15 items
3	Is there a significant difference in motivational factors among instructors based on their academic field, teaching experience, and sex?	Part III of the Survey, Table 1 - 23 items
4	Is there a significant difference in barrier factors among instructors based on their academic field, teaching experience, and sex?	Part III of the Survey, Table 2 - 18 items

Summary

This chapter explained the methodology used to accomplish the purpose of the study. It included research questions, instrument development procedures, research procedures, a description of the study sample, a discussion of the instrumentation employed to answer the research questions, the pilot study, and the description of the data

analysis. The findings from the analysis of the data are presented in Chapter IV.

CHAPTER (IV)

Results of the Study

The objective of this chapter is to present the findings of the study. This study consisted of two sets of questions. The first set contained descriptive questions, and the second set contained inferential questions. The study used these questions to determine whether significant differences exist among instructors from King Abdulaziz University's (KAU) Humanities and Scientific Colleges concerning their use of e-learning technologies based on the three independent variables: academic field, years of teaching experience, and sex.

The chapter is presented in three sections. The first section presents the factor analysis findings. It also shows the general demographic characteristics of the population and sample (academic field, years of teaching experience, and sex). This section also includes general and specific technological expertise of the participants, levels of current usage e-learning technologies, motivating factors, and impediment factors. The second section shows the results of inferential statistical analysis of the data to determine whether significant differences exist among instructors from KAU concerning their use of e-learning

technologies based on the three independent variables: academic field, years of teaching experience, and sex. The third section of the chapter presents a summary of the findings.

General Characteristics of the population and sample

The population of the study consisted of roughly 2000 instructors from the King Abdulaziz University (KAU) in Saudi Arabia during the academic year of 2007-2008. This population included separate men's and women's sections at the campus in Jeddah. Section one of the survey collected participants' individual information about their sex, academic field, and years of teaching experience. A total of 227 instructors from KAU were analyzed in this study, and the frequency of the participant characteristics are shown below.

Out of the 600 surveys that were distributed, 285 surveys were returned. All of the surveys that included missing data were excluded from analysis. The resulting 227 surveys were analyzed using SPSS software.

The characteristics of the sample based on sex showed that this study contained a majority of female participants. Table (4.1) shows that of the 227 participants in the study 127 of the participants were

female (55.9%), and there were 100 male participants (44.1%) in the study.

Table 4.1: Frequency of participants' sex:

Sex	Frequency	Percent	Valid Percent	Cumulative Percent
Valid male	100	44.1	44.1	44.1
female	127	55.9	55.9	100.0
Total	227	100.0	100.0	

The characteristics of the participants based on academic field show that this study contained a majority of participants in the field of science. Table (4.2) shows that of the 227 participants, 135 participants (59.5%) were instructors for the scientific college of KAU. 92 participants (40.5%) were instructors for the Humanities college of KAU.

Table 4.2 : Frequency of participants' academic field:

Academic field	Frequency	Percent	Valid Percent	Cumulative Percent
Valid scientific	135	59.5	59.5	59.5
Humanities	92	40.5	40.5	100.0
Total	227	100.0	100.0	

The frequency of experience of the participants was also analyzed. Experience was operationalized into 4 intervals (0-5, 6-10, 11-15, and over 15 years of teaching experience). Table (4.3) shows that 50 participants (22.0%) had 0-5 years of experience, 42 participants (18.5%) had 6-10 years of experience, 43 participants (18.9%) had 11-15

years of experience, and 92 participants (40.5%) had over 15 years of experience. These findings show that the majority of the participants in this study had over 15 years of teaching experience. A visual representation of this frequency can be seen in Fig. (4.1)

Table 4.3 : Frequency of participants' experience:

Years of Experience	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0-5	50	22.0	22.0	22.0
6-10	42	18.5	18.5	40.5
11-15	43	18.9	18.9	59.5
15+	92	40.5	40.5	100.0
Total	227	100.0	100.0

Figure 4.1: Frequency of years of teaching experience

The frequency of sex by academic field was also analyzed. Table (4.4) shows the distribution of men and women by academic field. 60 men were in the college of science, and 40 men were in the college of humanities. There were 75 females in the college of science and 52 females in the college of humanities. This distribution is represented visually in Fig (4.2).

Table 4.4: Number of participants by their sex and academic field

		Count	
		Academic field	
		scientific	Humanities
Sex	male	60	40
	female	75	52
Total		135	92

Fig.4.2: Frequency of participants by their sex and academic field

The frequency of academic field by years of teaching experience was also analyzed. Table (4.5) shows this distribution. This distribution indicates that the largest frequency of academic field by years of experience existed in the scientific field with participants that had over 15 years of experience. The smallest frequency existed in the Humanities College with participants that had 0-5 years of experience.

Table 4.5: Frequency of experience by academic field

Count	Academic field		Total
	scientific	Humanities	
Experience 0-5	35	15	50
6-10	16	26	42
11-15	23	20	43
15+	61	31	92
Total	135	92	227

A Cross table descriptive distribution of sex by years of teaching experience was also analyzed. Table (4.6) shows this distribution and indicates that the majority of male participants (43 participants) had over 15 years of experience. The majority of female participants (49 participants) also had over 15 years of experience. The largest frequency of sex by years of experience occurred with female participants that had over 15 years of

experience. For a visual representation of this distribution, see Fig. (4.3).

Table 4.6: Frequency of experience by sex:

Count		Experience				Total
		0-5	6-10	11-15	15+	
Sex	male	24	18	15	43	100
	female	26	24	28	49	127
Total		50	42	43	92	227

Figure 4.3 : Frequency of experience by sex

General expertise of participants:

The participants were asked to rate their general expertise as well as 12 specific areas of expertise on a 5

point Likert-like scale (Don't use = 0, Novice = 1, Intermediate = 2, Proficient = 3, Expert = 4). The mean of the general expertise value was (2.63) of 4 and the standard deviation was 0.843 (see Table 4.7). The mean value reveals that the majority of participants in this study have a positive sense of general expertise.

Table 4.7: Descriptive of general expertise

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Genral Expertise	227	0	4	2.63	.843
Valid N (listwise)	227				

The entire breakdown of the distribution for general expertise can be seen in Table (4.8) and Fig. (4.4). This distribution shows that the majority of participants (116 participants or 51.1%) rated themselves as proficient. As shown in (Appendix E), the majority of these participants with proficient expertise can be found in the college of science. In addition, only four participants rated themselves as having no expertise, and all four participants were found in the Humanities College.

Table 4.8: Frequency of general expertise

Genral Expertise					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Don't use	4	1.8	1.8	1.8
	Novice	16	7.0	7.0	8.8
	Intermediate	65	28.6	28.6	37.4
	Proficient	116	51.1	51.1	88.5
	Expert	26	11.5	11.5	100.0
	Total	227	100.0	100.0	

Fig. (4.5) provides a visual representation of the general expertise by academic field.

Figure 4.4: Frequency of general expertise

Figure 4.5: Frequency of general expertise by academic field

The frequency of sex and general expertise was also analyzed, see (Appendix F). This distribution shows that the largest frequency occurred with females who rated themselves as proficient. None of the female participants, however, rated themselves as experts, but 23 male participants chose the rating of expert. On the other hand, no male participants chose the rating of no expertise, but 4 females chose this rating, see Fig. (4.6).

Figure 4.6: Frequency of general expertise by sex

Specific expertise of participants

Along with the general expertise, participants rated their expertise in 12 specific areas with the same 5 point Likert-like scale that was used for general expertise. The

mean value for specific expertise was positive (2.33), and the majority of participants (78.3%) rated themselves as being at least "Intermediate" with specific expertise (see Table 4.10). From an analysis of the data, the top three specific items of expertise include 1) Using a computer to find resources from the university library, 2) Using a word processor to create documents, 3) Using presentation software (e.g., PowerPoint); the lower three specific items of expertise include 1) Website design, 2) Use of electronic bulletin board, and 3) Use video conferencing (see Table 4.9).

Table 4.9: Factors of specific expertise:

Factors of Expertise	N	Mean	Std. Deviation
3- Use a computer to find resources from the university library.	227	3.04	1.008
1- Use a word processor to create documents.	227	2.94	.985
6- Use presentation software (e.g., PowerPoint).	227	2.81	1.192
4- Searching the web to find information and resources.	227	2.66	1.170
2- Use a spreadsheet to create charts and graphs.	227	2.53	1.176
5- Use a database software to set up and access information.	227	2.52	1.263
10- Use a computer to communicate with others.	227	2.37	1.368
7- Use graphic software to create illustrations, slides, or images.	227	2.24	1.261
8- Use audio/video clips software to create or enhance presentations.	227	2.05	1.323
9- Website design.	227	1.33	1.320
11- Use of electronic bulletin board.	227	1.15	1.320
12- Use video conferencing	227	1.13	1.307

Table 4.10: Descriptive of specific expertise:

SPECIFIC EXPERTISE	Frequency	Percent	Statistics	
Don't use	3	1.3		
Novice	46	20.3	Mean	2.33
Intermediate	80	35.2	Std. Deviation	.977
Proficient	70	30.8	Minimum	0
Expert	28	12.3	Maximum	4
Total	227	100.0		

Current use e-learning by participants:

Participants also rated their current use of e-learning with 15 specific items using a 5 point Likert-like scale [0 = Never (0%), 1 = Seldom (1-25%), 2 = occasionally (26-50%), 3 = Often (51-75%), 4 = Almost all the time (76-100%)]. The mean value for current use was negative (1.41), and the majority of participants (63.4%) rated themselves as "Seldom" using e-learning technologies (see Table 4.11). An analysis of this distribution indicated that the top three items of current use include 1) Internet research and searches, 2) Computer software for handouts or lecture notes, and 3) Presentation software in the classroom; the lower three items of current use include 1) Electronics conferencing, 2) Use personally designed Web-based lectures, notes, or tutorials, and 3) Use personally designed Web-based tests or quizzes (See Table 4.12). This table shows the mean and standard deviation value for all 15 items of current use.

Table 4.11: Descriptive of current use e-learning

CURRENT USE	Frequency	Percent	Statistics	
Never	5	2.2		
Seldom	144	63.4	Mean	1.41
Occasionally	61	26.9	Std. Deviation	.714
Often	13	5.7	Minimum	0
Almost	4	1.8	Maximum	4
Total	227	100.0		

Table 4.12: Factors of current use of e-learning

Factors of Current Use	N	Mean	Std. Deviation
9- Used Internet research and searches.	227	3.02	1.244
1- Use of computer software for handouts or lecture notes.	227	2.60	1.380
4- Use of presentation software in the classroom.	227	2.19	1.558
3- Hold virtual office hours.	227	1.50	1.415
2- Use Email as the primary source of student contact outside the classroom.	227	1.46	1.380
8- Provided web-based grades.	227	1.37	1.587
10- Posting required readings on course web page.	227	1.37	1.452
14- Use video tapes for instruction.	227	1.14	1.221
15- Use audio tapes for instruction.	227	.86	1.104
11- Use On-line Chat room	227	.83	1.179
5- Use On-line bulletin board.	227	.80	1.122
12- Commenting on course work electronically.	227	.67	1.114
13- Electronics conferencing.	227	.54	.946
6- Use personally designed Web-based lectures, notes, or tutorials.	227	.52	.966
7- Use personally designed Web-based tests or quizzes.	227	.43	.963

Motivation of participants

The motivation of the participants for using e-learning was also found by using a 5 point Likert-like scale [Highly Discouraging (HD) = 0, Discouraging (D) = 1, Not a Factor (NF) = 2, Encouraging (E) = 3, Highly

Encouraging (HE) = 4]. The mean value for motivation was positive (2.99), and the majority of participants (78.5%) rated motivational factors as being "Encouraging" or "Highly Encouraging" (see Table 4.13). The top three motivational factors included 1) personal computer skills, 2) the opportunity to improve teaching, and 3) classroom technology infrastructure (e.g., wiring, computers, or projectors); The lower three motivational factors included 1) Support and encouragement from peers, 2) Opportunity to reach new audience that can not attend classes on campus, and 3) Credit toward promotion and tenure, (see Table 4.14). These factors were also analyzed in terms of being extrinsic or intrinsic, and the top two motivational factors were found to be intrinsic. These results show that intrinsic motivational factors are more important than extrinsic factors in encouraging an instructor to adopt and use e-learning. This finding is in accordance with the findings of the literature review in this study.

Table 4.13: Motivational factors

MOTIVATION	Frequency	Percent	Statistics	
Highly Discouraging	3	1.3	Mean	2.99
Discouraging	15	6.6		
Not a Factor	31	13.7		
Encouraging	110	48.5	Std. Deviation	.907
Highly Encouraging	68	30.0	Minimum	0
Total	227	100.0	Maximum	4

Table 4.14: Motivational factors

Factor of Motivations	N	Type of Factor	Mean	Std. Deviation
21- My computer skills	227	Intrinsic	3.25	.969
10- Opportunity to improve teaching	227	Intrinsic	3.23	.917
17- Classroom technology infrastructure (e.g., wiring , computers, or projectors)	227	Extrinsic	3.22	1.151
18- Resources about how to apply technology in teaching.	227	Extrinsic	3.18	1.345
19- Student' access to resources	227	Extrinsic	3.15	1.144
15- Opportunity for scholarly pursuit	227	Intrinsic	3.07	1.124
16- Funding for materials/expenses	227	Extrinsic	3.07	1.212
23- Opportunity to enhance communication with others.	227	Extrinsic	3.05	1.014
20- Student' computer skills	227	Extrinsic	3.00	1.144
22- My colleagues' computer skills	227	Extrinsic	2.99	.975
2- Administrative encouragement and support	227	Extrinsic	2.96	1.064
8- Training programs and support	227	Extrinsic	2.95	1.145
12- Time available to learn/pursue the integration of e-learning technologies	227	Extrinsic	2.93	1.197
11- Rewards/recognition for innovation in teaching	227	Extrinsic	2.92	1.270
5- Access to software tools for enhancing teaching with technology	227	Extrinsic	2.88	1.186
3- Technical support in solving computer problems	227	Extrinsic	2.88	1.187
13-Increase in salary.	227	Extrinsic	2.83	1.307
9- Reduced teaching load.	227	Extrinsic	2.82	1.165
7- Professional prestige and status	227	Intrinsic	2.79	1.166
1- Requirement by department or university	227	Extrinsic	2.77	1.129
4- Support and encouragement from peers	227	Extrinsic	2.77	1.078
14- Opportunity to reach new audience that can not attend classes on campus.	227	Intrinsic	2.73	1.221
6- Credit toward promotion and tenure	227	Intrinsic	2.62	1.215

Barriers for participants

The barriers for the participants to use e-learning were also found by using a 5 point Likert-like scale [0 = No barriers (NB), 1 = Very few barriers (VFB), 2 = Few barriers (FB), 3 = some barriers (SB), 4 = Many barriers (MB)]. The mean value for barriers was positive (2.70), and

the majority of participants (64.7%) rated barrier factors as being "Some" or "Many" (see Table 4.15). Table 4.11 shows this distribution of barrier factors and includes the mean and standard deviation for each. The top three barrier factors included 1)lack of technological infrastructure, 2)lack of students' access to resources, and 3)lack of technical support in solving computer problems; The top three barrier factors included 1) Security concerns,2) Lack of support and encouragement from peers, and 3) Negative comments made by colleagues about e-learning technologies,(See Table 4.16). All of these barriers are extrinsic factors, and this finding shows that extrinsic barrier factors are more inhibitive than intrinsic factors.

Table 4.15: Barrier Factors

BARRIERS	Frequency	Percent	Statistics	
No barriers	2	.9		
very few barriers	17	7.5	Mean	2.70
few barriers	61	26.9	Std. Deviation	.840
some barriers	114	50.2	Minimum	0
many barrier	33	14.5	Maximum	4
Total	227	100.0		

The result of factor analysis

The object this section was to present the findings of the factor analysis conducted to investigate the four dependent variables of the study: 1. technology expertise,

2. current use of e-learning, 3. motivation to use e-learning, and 4. barriers of using e-learning.

Table 4.16: Barrier Factors

Factor of Barriers	N	Type of Factor	Mean	Std. Deviation
15- Lack of technological infrastructure.	227	Extrinsic	3.20	1.125
16- Lack of Student' access to resources.	227	Extrinsic	3.16	1.210
14- Lack of technical support in solving computer problems.	227	Extrinsic	3.10	1.122
11- Lack of funding for materials/expenses.	227	Extrinsic	3.07	1.113
8- Lack of training programs.	227	Extrinsic	3.02	1.054
17- Lack of resources about how to apply technology in teaching.	227	Extrinsic	2.93	1.210
7- Lack of students' technological knowledge.	227	Extrinsic	2.88	1.180
6- Lack of instructors' technological knowledge.	227	Intrinsic	2.82	1.285
4- Lack of support and encouragement from administrative.	227	Extrinsic	2.74	1.332
9- Lack of face-to-face interaction in e-learning courses.	227	Intrinsic	2.73	1.224
2- Lack of time to learn new technology	227	Extrinsic	2.68	1.154
1- Lack of interest.	227	Intrinsic	2.66	1.298
12- Lack of rewards/recognition for innovation in teaching	227	Extrinsic	2.54	1.311
13- Concern about course quality.	227	Intrinsic	2.26	1.516
10- Lack of credit toward promotion and tenure.	227	Intrinsic	2.19	1.422
18- Security concerns.	227	Intrinsic	2.17	1.405
5- Lack of support and encouragement from peers.	227	Extrinsic	1.84	1.421
3- Negative comments made by colleagues about e-learning technologies.	227	Extrinsic	1.60	1.455

Technology Expertise

The factor analysis was conducted to investigate the items of the first variable: technology expertise. Namely, the KMO and Bartlett's test was conducted first to show whether to use factor analysis or not. The value of the test (see Table 4 .17) was significant (.902) which means

the use of factor analysis was appropriate. The researcher then conducted the Principle Components Analysis method to extract the data. The 12 items of the variable were grouped into two factors and the cumulative variance of these two factors was (69.38%). See appendix (L) for details.

Table 4.17: KMO and Bartlett's test for technology expertise

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.902
Bartlett's Test of Sphericity	Approx. Chi-Square	1922.420
	df	66
	Sig.	.000

Current Use of e-Learning

The factor analysis was conducted to explore the second variable of the study: current use of e-learning. The result of KMO and Bartlett's test (see Table 4.18) was significant (.887). The Principle Components Analysis method was conducted.

Table 4.18: KMO and Bartlett's test for current usage of e-learning

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.887
Bartlett's Test of Sphericity	Approx. Chi-Square	1921.710
	df	105
	Sig.	.000

The items were loaded into three factors. The cumulative variance of the three factors was (65.01%). See appendix (M) for details.

Motivation for Use e-Learning

The KMO and Bartlett's test results (See Table 4.19) were significant (.951). The Principle Components Analysis method grouped the 23 items into 4 factors. The cumulative variance of the four factors was (73.79%). For details, see appendix (N)

Table 4.19: KMO and Bartlett's test for motivation to use e-learning

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.951
Bartlett's Test of Sphericity	Approx. Chi-Square	4752.417
	df	253
	Sig.	.000

Barriers of using e-Learning

Similar to the three variables, the KMO and Bartlett's test results (See Table 4.20) were significant (.887). The 18 items of the variable were grouped into 4 factors to represent (64.42%) of the cumulative variance. See appendix (O) for more details.

Table 4.20: KMO and Bartlett's test for barriers of using e-learning

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.887
Bartlett's Test of Sphericity	Approx. Chi-Square	2162.845
	df	153
	Sig.	.000

The findings of factor analysis showed that the questionnaires of the study were appropriate to answer the research questions. They also revealed that the variables of the study were appropriately selected to achieve the study goal. Interestingly, the findings of the factor analysis were consistent with the findings of the descriptive techniques used to answer the first set of the research question. For example, the findings of technology expertise variable in descriptive techniques and factor analysis divided the 12 items of the questionnaire into two groups. The first group (9 items) includes items that revealed the skills that most of technology users master. The second group (3 items) showed the skills that advanced user of technology master (See Table 4.21) and (figure 4.7).

Table 4.21: Factors of specific expertise:

Factors of Expertise	N	Mean	Std. Deviation
3- Use a computer to find resources from the university library.	227	3.04	1.008
1- Use a word processor to create documents.	227	2.94	.985
6- Use presentation software (e.g., PowerPoint).	227	2.81	1.192
4- Searching the web to find information and resources.	227	2.66	1.170
2- Use a spreadsheet to create charts and graphs.	227	2.53	1.176
5- Use a database software to set up and access information.	227	2.52	1.263
10- Use a computer to communicate with others.	227	2.37	1.368
7- Use graphic software to create illustrations, slides, or images.	227	2.24	1.261
8- Use audio/video clips software to create or enhance presentations.	227	2.05	1.323
9- Website design.	227	1.33	1.320
11- Use of electronic bulletin board.	227	1.15	1.320
12- Use video conferencing	227	1.13	1.307

Component Plot in Rotated Space **Figure 4.7:** Component plot in rotated space for expertise

The results of inferential statistics

The objective of this section was to investigate potential differences among participants regarding four dependent variables (expertise, current use, motivation, and barriers) by three independent variables (academic field, teaching experience, and sex) at the 0.05 level of significance.

The statistical method of 3-way factorial ANOVA (A x B x C Factorial Design) as the number 2x2x4 and Scheffe's Post Hoc Analysis (for experience) was used to test the four null hypotheses. The four null hypotheses state that there are no differences among the seven means for each null hypothesis: in symbols,

$$\mu_{0A} = \mu_{0B} = \mu_{0C} = \mu_{0AB} = \mu_{0AC} = \mu_{0BC} = \mu_{0ABC}$$

H₀₁: There is no significant difference in the technology expertise of instructors based on (A) their sex, (B) their academic field, and (C) their teaching experience.

The 3-way factorial ANOVA consists of seven hypothesis tests, each evaluating specific mean differences: the A effect, the B effect, the C effect, the A x B interaction, the A x C interaction, the B x C interaction, and the A x B x C interaction:

Main effect A: $\mu_{\text{sex (male)}} = \mu_{\text{sex (female)}}$

Main effect B: $\mu_{\text{academic field (scientific)}} = \mu_{\text{academic field (humanities)}}$

Main effect C: $\mu_{\text{experience (0-5)}} = \mu_{\text{experience (6-11)}} = \mu_{\text{experience (11-15)}} = \mu_{\text{experience (over 15)}}$

Interaction AB: $\mu_{\text{sex (male) academic field (scientific)}} = \mu_{\text{sex (male) academic field (humanities)}}$

$= \mu_{\text{sex (female) academic field (scientific)}} = \mu_{\text{sex (female) academic field (humanities)}}$

Interaction AC: $\mu_{\text{sex (male) experience (0-5)}} = \mu_{\text{sex (male) experience (6-10)}} = \mu_{\text{sex (male) experience (11-15)}} = \mu_{\text{sex (male) experience (over 15)}}$

$= \mu_{\text{sex (female) experience (0-5)}} = \mu_{\text{sex (female) experience (6-10)}} = \mu_{\text{sex (female) experience (11-15)}} = \mu_{\text{sex (female) experience (over 15)}}$

$= \mu_{\text{sex (male) experience (0-5)}} = \mu_{\text{sex (male) experience (6-10)}} = \mu_{\text{sex (male) experience (11-15)}} = \mu_{\text{sex (male) experience (over 15)}}$

$= \mu_{\text{sex (female) experience (0-5)}} = \mu_{\text{sex (female) experience (6-10)}} = \mu_{\text{sex (female) experience (11-15)}} = \mu_{\text{sex (female) experience (over 15)}}$

Interaction BC: $\mu_{\text{academic field (scientific) experience (0-5)}} = \mu_{\text{academic field (scientific) experience (6-10)}}$

$= \mu_{\text{academic field (scientific) experience (11-15)}} = \mu_{\text{academic field (scientific) experience (over 15)}}$

$= \mu_{\text{academic field (humanities) experience (0-5)}} = \mu_{\text{academic field (humanities) experience (6-10)}}$

$= \mu_{\text{academic field (humanities) experience (11-15)}} = \mu_{\text{academic field (humanities) experience (over 15)}}$

$= \mu_{\text{academic field (humanities) experience (over 15)}}$

Interaction ABC: $\mu_{\text{sex (male) academic field (scientific) experience (0-5)}} = \mu_{\text{sex (male) academic field (humanities) experience (0-5)}}$

$= \mu_{\text{sex (female) academic field (scientific) experience (0-5)}} = \mu_{\text{sex (female) academic field (humanities) experience (0-5)}}$

$= \mu_{\text{sex (male) academic field (scientific) experience (6-10)}} = \mu_{\text{sex (male) academic field (humanities) experience (6-10)}}$

$= \mu_{\text{sex (male) academic field (scientific) experience (11-15)}} = \mu_{\text{sex (male) academic field (humanities) experience (11-15)}}$

$= \mu_{\text{sex (male) academic field (scientific) experience (over 15)}} = \mu_{\text{sex (male) academic field (humanities) experience (over 15)}}$

$= \mu_{\text{sex (female) academic field (scientific) experience (0-5)}} = \mu_{\text{sex (female) academic field (humanities) experience (0-5)}}$

$= \mu_{\text{sex (female) academic field (scientific) experience (6-10)}} = \mu_{\text{sex (female) academic field (humanities) experience (6-10)}}$

$= \mu_{\text{sex (female) academic field (scientific) experience (11-15)}} = \mu_{\text{sex (female) academic field (humanities) experience (11-15)}}$

$= \mu_{\text{sex (female) academic field (scientific) experience (over 15)}} = \mu_{\text{sex (female) academic field (humanities) experience (over 15)}}$

$$\begin{aligned} \text{experience (over 15)} &= \mu_{\text{academic field (humanities) experience (0-5)}} = \mu_{\text{academic field}} \\ &(\text{humanities) experience (6-10)} = \mu_{\text{academic field (humanities) experience (11-15)}} = \mu_{\text{academic field (humanities) experience (over 15)}} \end{aligned}$$

The results of each of the three main effects are briefly presented. Results presented on each main effect are the means, levels of significance and post hoc comparisons, if the results proved to be significant. These results are shown for all the null hypotheses.

General technology expertise

Main Effect A (Sex: male versus female)

The results (See Table 4.22) indicated that there was a significant difference in the general technology expertise of instructors based on their sex ($F = 10.244$; $P = .002$) with ($\alpha = 0.05$). The null Hypothesis for the main effect A was rejected. The men showed a higher mean value than the women, and this finding shows that men rate themselves as having a higher level of general expertise. As shown in Table 4.22, the effect size of this significant difference as measured by partial Eta squared was 0.046, which is a small effect. Further details are in (Appendix G).

Main Effect B (Academic field: Scientific versus Humanities)

The results (See Table 4.22) indicated that there was a significant difference in the general technology expertise of instructors based on their academic field ($F=6.752$; $P=0.010$) with ($\alpha = 0.05$). The null Hypothesis for the main effect B was rejected. The scientific field showed a higher mean value than the humanities field, and this finding shows that the scientists rate themselves as having a higher level of general expertise. As shown in Table (4.22), the effect size of this significant difference as measured by partial Eta squared was 0.031, which is a small effect. Further details are in (Appendix G).

Main Effect C (experience: four categories)

The results (See Table 4.22) indicated that there was a significant difference in the general technology expertise of instructors based on their experience ($F=3.078$; $P=0.029$) with ($\alpha = 0.05$). The null Hypothesis for the main effect C was rejected. As shown in Table 4.22, the effect size of this significant difference as measured by partial Eta squared was 0.042, which is a small effect. Further details are in (Appendix C). Scheffe's Post Hoc Analysis was also conducted for experience, and the results of this analysis can be found in Appendix G.

AB Interaction (Sex & Academic field)

The results (See Table 4.22) indicated that there was a significant difference in the general technology expertise of instructors based on *AB Interaction* ($F= 8.989$; $P= 0.003$) with ($\alpha = 0.05$). The null Hypothesis for the *AB Interaction* was rejected. As shown in Table 4.22, the effect size of this significant difference as measured by partial Eta squared was 0.041, which is a small effect. The estimated marginal means and profile plots revealed an interaction between the two factors (sex and academic field), suggesting that male instructors in scientific were less in their technology expertise than their counterparts in humanities. The pattern is reversed for female instructors. Further details are in (Appendix G).

AC Interaction (Sex & Experience)

The results (See Table 4.22) indicated that there was no significant difference in the general technology expertise of instructors based on *AC Interaction* ($F= 0.383$; $P= 0.765$) with ($\alpha = 0.05$). The analysis failed to reject the null Hypothesis for the *AC Interaction*. As shown in Table 4.22, the effect size of this significant difference as measured by partial Eta squared was 0.005, which is a small effect. Further details are in (Appendix G).

BC Interaction (Academic field & Experience)

The results (See Table 4.22) indicated that there was a significant difference in the general technology expertise of instructors based on *BC Interaction* ($F= 3.540$; $P= 0.016$) with ($\alpha = 0.05$). The null Hypothesis for the *BC Interaction* was rejected. As shown in Table (4.22), the effect size of this significant difference as measured by partial Eta squared was 0.048, which is a small effect. The estimated marginal means and profile plots revealed an interaction between the two factors (academic field and experience) showed the scientific instructors who had 11-15 year experience had more general expertise than those who had either less or more years of experience. As for instructors in humanities, the findings showed that those who hold 6-11 years of experience were more in their technology expertise than others. The humanities and scientific instructors had two interactions. The first one was 5-6 years of experience and the second one 6-11 years of experience. Further details are in (Appendix G).

ABC Interaction (Sex & Academic field & Experience)

The results (See Table 4.22) indicated that there was no significant difference in the general technology expertise of instructors based on *ABC Interaction* ($F= 0.412$; $P= 0.744$) with ($\alpha = 0.05$). The analysis failed to

reject the null Hypothesis for the *ABC Interaction*. As shown in Table (4.22), the effect size of this significant difference as measured by partial Eta squared was 0.006, which is a small effect. Further details are in (Appendix G).

The 3-way ANOVA did not tell which experience categories were different from others in regard to general technology expertise. To find out where the difference existed, the Scheffe's post hoc test was administered to distinguish the differences among the four categories of experience based on the observed means. Full results of this analysis are available in (Appendix G). The results of Scheffé's method indicate that there was no significant difference in general expertise among the experience categories.

Specific technology expertise

Main Effect A (Sex: male versus female)

The results (See Table 4.23) indicated that there was a significant difference in the specific technology expertise of instructors based on their sex ($F = 18.230$; $P = .000$) with ($\alpha = 0.05$). The null Hypothesis for the main effect A was rejected. As shown in Table (4.23), the effect

Table 4.22: 3-way Factorial ANOVA of General Expertise:**Tests of Between-Subjects Effects**

Dependent Variable: General Expertise

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	29.777 ^a	15	1.985	3.201	.000	.185
Intercept	1174.432	1	1174.432	1893.453	.000	.900
Sex	6.342	1	6.342	10.224	.002	.046
Afield	4.188	1	4.188	6.752	.010	.031
Experien	5.727	3	1.909	3.078	.029	.042
Sex * Afield	5.575	1	5.575	8.989	.003	.041
Sex * Experien	.713	3	.238	.383	.765	.005
Afield * Experien	6.588	3	2.196	3.540	.016	.048
Sex * Afield * Experien	.767	3	.256	.412	.744	.006
Error	130.875	211	.620			
Total	1736.000	227				
Corrected Total	160.652	226				

a. R Squared = .185 (Adjusted R Squared = .127)

size of this significant difference as measured by partial Eta squared was 0.080, which is a small effect. Further details are in (Appendix H).

Main Effect B (Academic field: Scientific versus Humanities)

The results (See Table 4.23) indicated that there was no significant difference in the specific technology expertise of instructors based on their academic field ($F=2.749$; $P=0.099$) with ($\alpha=0.05$). These results failed to reject the null Hypothesis for the main effect B. As shown in Table (4.23), the effect size of this significant difference as measured by partial Eta squared was 0.013, which is a small effect. Further details are in (Appendix H).

Main Effect C (experience: four categories)

The results (See Table 4.23) indicated that there was no significant difference in the specific technology expertise of instructors based on their experience ($F=1.447$; $P=0.230$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the main effect C. As shown in Table (4.23), the effect size of this significant difference as measured by partial Eta squared was 0.020, which is a small effect. Further details are in (Appendix H).

AB Interaction (Sex & Academic field)

The results (See Table 4.23) indicated that there was a significant difference in the specific technology expertise of instructors based on *AB Interaction* ($F=7.216$; $P=0.008$) with ($\alpha = 0.05$). The null Hypothesis for the *AB Interaction* was rejected. As shown in Table (4.23), the effect size of this significant difference as measured by partial Eta squared was 0.033, which is a small effect. The estimated marginal means and profile plots revealed an interaction between the two factors (sex and academic field), suggesting that male instructors in scientific were less in their specific technology expertise than their counterparts in humanities. The pattern is reversed for female instructors. Further details are in (Appendix H).

AC Interaction (Sex & Experience)

The results (See Table 4.23) indicated that there was no significant difference in the specific technology expertise of instructors based on *AC Interaction* ($F= 1.138$; $P= 0.335$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *AC Interaction*. As shown in Table (4.23), the effect size of this significant difference as measured by partial Eta squared was 0.016, which is a small effect. Further details are in (Appendix H).

BC Interaction (Academic field& Experience)

The results (See Table 4.23) indicated that there was a significant difference in the specific technology expertise of instructors based on *BC Interaction* ($F= 2.998$; $P= 0.032$) with ($\alpha = 0.05$). The null Hypothesis for the *BC Interaction* was rejected. As shown in Table (4.23), the effect size of this significant difference as measured by partial Eta squared was 0.041, which is a small effect.

estimated marginal means and profile plots revealed an interaction between the two factors (academic field and experience) showed the scientific instructors who had 11-15 year experience had more specific expertise than those who had either less or more years of experience. As for instructors in humanities, the findings showed that those who hold 6-10 years of experience were more in their

specific technology expertise than others. The humanities and scientific instructors had two interactions. The first one was 5-6 years of experience and the second one 10 -11 years of experience. Further details are in (Appendix H).

ABC Interaction (Sex & Academic field& Experience)

The results (See Table 4.23) indicated that there was no significant difference in the specific technology expertise of instructors based on *ABC Interaction* ($F = 0.911$; $P = 0.436$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *ABC Interaction*. As shown in Table (4.23), the effect size of this significant difference as measured by partial Eta squared was 0.013, which is a small effect. Further details are in (Appendix H).

The 3-way ANOVA did not tell which experience categories were different from others with regard to specific technology expertise. To find out where the difference existed, the Scheffe's post hoc test was administered to distinguish the differences among the four categories of experience based on the observed means. Full results of this analysis are available in (Appendix H). The results of Scheffé's method indicate that there was no significant difference in specific expertise among the experience categories.

Table 4.23: 3-way Factorial ANOVA of Specific Expertise:**Tests of Between-Subjects Effects**

Dependent Variable: SPECIFIC EXPERTISE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	41.864 ^a	15	2.791	3.384	.000	.194
Intercept	934.122	1	934.122	1132.676	.000	.843
Sex	15.035	1	15.035	18.230	.000	.080
Afield	2.267	1	2.267	2.749	.099	.013
Experien	3.580	3	1.193	1.447	.230	.020
Sex * Afield	5.951	1	5.951	7.216	.008	.033
Sex * Experien	2.816	3	.939	1.138	.335	.016
Afield * Experien	7.417	3	2.472	2.998	.032	.041
Sex * Afield * Experien	2.255	3	.752	.911	.436	.013
Error	174.012	211	.825			
Total	1444.000	227				
Corrected Total	215.877	226				

a. R Squared = .194 (Adjusted R Squared = .137)

Current Use of e-learning

Ho2: There is no significant difference in the use of e-learning by instructors based on (A) their sex, (B) their academic field, (C) their teaching experience. In symbols

$$\mu_{oA} = \mu_{oB} = \mu_{oC} = \mu_{oAB} = \mu_{oAC} = \mu_{oBC} = \mu_{oABC}$$

Main Effect A (Sex: male versus female)

The results (See Table 4.24) indicated that there was a significant difference in the current use of e-learning by instructors based on their sex ($F = 22.594$; $P = .000$) with ($\alpha = 0.05$). The null Hypothesis for the main effect A was rejected. The men showed a higher mean value than the women, and this finding shows that men rate themselves as having a higher level of current use. As

shown in Table 4.24, the effect size of this significant difference as measured by partial Eta squared was 0.097, which is a small effect. Further details are in (Appendix I).

Main Effect B (Academic field: Scientific versus Humanities)

The results (See Table 4.24) indicated that there was no significant difference in the current use of e-learning by instructors based on their sex ($F = 0.137$; $P = 0.712$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the main effect B. As shown in Table 4.24, the effect size of this significant difference as measured by partial Eta squared was 0.001, which is a small effect. Further details are in (Appendix I).

Main Effect C (experience: four categories)

The results (See Table 4.24) indicated that there was no significant difference in the current use of e-learning by instructors based on their experience ($F = 2.069$; $P = 0.105$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the main effect C. As shown in Table 4.24, the effect size of this significant difference as measured by partial Eta squared was 0.029, which is a small effect. Further details are in (Appendix I).

AB Interaction (Sex & Academic field)

The results (See Table 4.24) indicated that there was a significant difference in the current use of e-learning

by instructors based on *AB Interaction* ($F= 12.802$; $P= 0.000$) with ($\alpha = 0.05$). The null Hypothesis for the *AB Interaction* was rejected. As shown in Table 4.24, the effect size of this significant difference as measured by partial Eta squared was 0.057, which is a small effect. estimated marginal means and profile plots revealed an interaction between the two factors (sex and academic field), suggesting that male instructors in scientific were less in their using of e-learning than their counterparts in humanities. The pattern is reversed for female instructors. Further details are in (Appendix I).

AC Interaction (Sex & Experience)

The results (See Table 4.24) indicated that there was no significant difference in the current use of e-learning by instructors based on *AC Interaction* ($F= 2.342$; $P= 0.074$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *AC Interaction*. As shown in Table 4.24, the effect size of this significant difference as measured by partial Eta squared was 0.032, which is a small effect. Further details are in (Appendix I).

BC Interaction (Academic field& Experience)

The results (See Table 4.24) indicated that there was a significant difference in the current use of e-learning by instructors based on *BC Interaction* ($F= 3.644$; $P= 0.014$)

with ($\alpha = 0.05$). The null Hypothesis for the *BC Interaction* was rejected. As shown in Table 4.24, the effect size of this significant difference as measured by partial Eta squared was 0.049, which is a small effect. Estimated marginal means and profile plots revealed an interaction between the two factors (academic field and experience) showed the scientific instructors who had 11-15 year experience had more usage of e-learning than those who had either less or more years of experience. As for instructors in humanities, the findings showed that those who hold 6-10 years of experience were more in their specific technology expertise than others. The humanities and scientific instructors had two interactions. The first one was 5-6 years of experience and the second one 10 -11 years of experience. Further details are in (Appendix I).

ABC Interaction (Sex & Academic field& Experience)

The results (See Table 4.24) indicated that there was no significant difference in the current use of e-learning by instructors based on *ABC Interaction* ($F= 2.603$; $P= 0.053$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *ABC Interaction* was failed to reject. As shown in Table 4.24, the effect size of this significant difference as measured by partial Eta squared

was 0.036, which is a small effect. Further details are in (Appendix I).

The 3-way ANOVA did not tell which experience categories were different from others with regard to current use of e-learning. To find out where the difference existed, the Scheffe's post hoc test was administered to distinguish the differences among the four categories of experience based on the observed means. Full results of this analysis are available in (Appendix I). The results of Scheffé's method indicate that there was no significant difference in current use of e-learning among the experience categories.

Table 4.24: 3-way Factorial ANOVA of Current Use e-learning:

Tests of Between-Subjects Effects

Dependent Variable: CURRENT USE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	22.024 ^a	15	1.468	3.329	.000	.191
Intercept	364.392	1	364.392	826.285	.000	.797
Sex	9.964	1	9.964	22.594	.000	.097
Afield	.060	1	.060	.137	.712	.001
Experien	2.738	3	.913	2.069	.105	.029
Sex * Afield	5.646	1	5.646	12.802	.000	.057
Sex * Experien	3.098	3	1.033	2.342	.074	.032
Afield * Experien	4.821	3	1.607	3.644	.014	.049
Sex * Afield * Experien	3.444	3	1.148	2.603	.053	.036
Error	93.051	211	.441			
Total	569.000	227				
Corrected Total	115.075	226				

a. R Squared = .191 (Adjusted R Squared = .134)

Motivational factors

Ho3: There is no significant difference in motivational factors among instructors based on (A) their sex, (B) their academic field, and (C) their teaching experience. In symbols,

$$\mu_{0A} = \mu_{0B} = \mu_{0C} = \mu_{0AB} = \mu_{0AC} = \mu_{0BC} = \mu_{0ABC}$$

Main Effect A (Sex: male versus female)

The results (See Table 4.25) indicated that there was no significant difference in motivational factors among instructors based on their sex ($F = 0.965$; $P = .327$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the main effect A. As shown in Table 4.25, the effect size of this significant difference as measured by partial Eta squared was 0.005, which is a small effect. Further details are in (Appendix J).

Main Effect B (Academic field: Scientific versus Humanities)

The results (See Table 4.25) indicated that there was no significant difference in motivational factors among instructors based on their sex ($F = 1.753$; $P = 0.187$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the main effect B. As shown in Table 4.25, the effect size of this significant difference as measured by partial Eta squared was 0.008, which is a small effect. Further details are in (Appendix J).

Main Effect C (experience: four categories)

The results (See Table 4.25) indicated that there was no significant difference in motivational factors among instructors based on their experience ($F = 0.435$; $P = 0.728$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the main effect C. As shown in Table 4.25, the effect size of this significant difference as measured by partial Eta squared was 0.006, which is a small effect. Further details are in (Appendix J).

AB Interaction (Sex & Academic field)

The results (See Table 4.25) indicated that there was no significant difference in motivational factors among instructors based on *AB Interaction* ($F = 1.007$; $P = 0.317$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *AB Interaction*. As shown in Table 4.25, the effect size of this significant difference as measured by partial Eta squared was 0.005, which is a small effect. Further details are in (Appendix J).

AC Interaction (Sex & Experience)

The results (See Table 4.25) indicated that there was no significant difference in motivational factors among instructors based on *AC Interaction* ($F = 1.150$; $P = 0.330$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *AC Interaction*. As shown in Table 4.25,

the effect size of this significant difference as measured by partial Eta squared was 0.016, which is a small effect. Further details are in (Appendix J).

BC Interaction (Academic field& Experience)

The results (See Table 4.25) indicated that there was no significant difference in motivational factors among instructors based on *BC Interaction* ($F = 1.065$; $P = 0.365$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *BC Interaction*. As shown in Table 4.25, the effect size of this significant difference as measured by partial Eta squared was 0.015, which is a small effect. Further details are in (Appendix J).

ABC Interaction (Sex & Academic field& Experience)

The results (See Table 4.25) indicated that there was no significant difference in motivational factors among instructors based on *ABC Interaction* ($F = 0.053$; $P = 0.984$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *ABC Interaction*. As shown in Table 4.25, the effect size of this significant difference as measured by partial Eta squared was 0.001, which is a small effect. Further details are in (Appendix J).

The 3-way ANOVA did not tell which experience categories were different from others with regard to factorial motivations. To find out where the difference

existed, the Scheffe's post hoc test was administered to distinguish the differences among the four categories of experience based on the observed means. Full results of this analysis are available in (Appendix J). The results of Scheffé's method indicate that there was no significant difference in factorial motivations among the experience categories.

Table 4.22 : 3-way Factorial ANOVA of Motivational Factors:

Tests of Between-Subjects Effects

Dependent Variable: MOTIVATION

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10.314 ^a	15	.688	.826	.648	.055
Intercept	1569.724	1	1569.724	1885.433	.000	.899
Sex	.803	1	.803	.965	.327	.005
Afield	1.460	1	1.460	1.753	.187	.008
Experien	1.086	3	.362	.435	.728	.006
Sex * Afield	.838	1	.838	1.007	.317	.005
Sex * Experien	2.873	3	.958	1.150	.330	.016
Afield * Experien	2.660	3	.887	1.065	.365	.015
Sex * Afield * Experien	.133	3	.044	.053	.984	.001
Error	175.669	211	.833			
Total	2217.000	227				
Corrected Total	185.982	226				

a. R Squared = .055 (Adjusted R Squared = -.012)

Barrier Factors

Ho4: There is no significant difference in barrier factors among instructors based on (A) their sex, (B) their academic field, and (C) their teaching experience. In symbols,

$$\mu_{0A} = \mu_{0B} = \mu_{0C} = \mu_{0AB} = \mu_{0AC} = \mu_{0BC} = \mu_{0ABC}$$

Main Effect A (Sex: male versus female)

The results (See Table 4.26) indicated that there was a significant difference in barrier factors among instructors based on their sex ($F = 5.447$; $P = .021$) with ($\alpha = 0.05$). The null Hypothesis for the main effect A was rejected. As shown in Table 4.26, the effect size of this significant difference as measured by partial Eta squared was 0.025, which is a small effect. Further details are in (Appendix K).

Main Effect B (Academic field: Scientific versus Humanities)

The results (See Table 4.26) indicated that there was no significant difference in barrier factors among instructors based on their sex ($F = 2.959$; $P = 0.087$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the main effect B. As shown in Table 4.26, the effect size of this significant difference as measured by partial Eta squared was 0.014, which is a small effect. Further details are in (Appendix K).

Main Effect C (experience: four categories)

The results (See Table 4.26) indicated that there was no significant difference in barrier factors among instructors based on their experience ($F = 0.727$; $P = 0.537$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the main effect C. As shown in Table 4.26,

the effect size of this significant difference as measured by partial Eta squared was 0.010, which is a small effect. Further details are in (Appendix K).

AB Interaction (Sex & Academic field)

The results (See Table 4.26) indicated that there was no significant difference in barrier factors among instructors based on *AB Interaction* ($F= 1.143$; $P= 0.286$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *AB Interaction*. As shown in Table 4.26, the effect size of this significant difference as measured by partial Eta squared was 0.005, which is a small effect. Further details are in (Appendix K).

AC Interaction (Sex & Experience)

The results (See Table 4.26) indicated that there was no significant difference in barrier factors among instructors based on *AC Interaction* ($F= 1.481$; $P= 0.221$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *AC Interaction*. As shown in Table 4.26, the effect size of this significant difference as measured by partial Eta squared was 0.021, which is a small effect. Further details are in (Appendix K).

BC Interaction (Academic field& Experience)

The results (See Table 4.26) indicated that there was no significant difference in barrier factors among

instructors based on *BC Interaction* ($F= 0.125$; $P= 0.946$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *BC Interaction*. As shown in Table 4.26, the effect size of this significant difference as measured by partial Eta squared was 0.002, which is a small effect. Further details are in (Appendix K).

ABC Interaction (Sex & Academic field& Experience)

The results (See Table 4.26) indicated that there was no significant difference in barrier factors among instructors based on *ABC Interaction* ($F= 1.273$; $P= 0.284$) with ($\alpha = 0.05$). These results failed to reject the null Hypothesis for the *ABC Interaction*. As shown in Table 4.26, the effect size of this significant difference as measured by partial Eta squared was 0.018, which is a small effect. Further details are in (Appendix K).

The 3-way ANOVA did not tell which experience categories were different from others with regard to barriers. To find out where the difference existed, the Scheffe's post hoc test was administered to distinguish the differences among the four categories of experience based on the observed means. Full results of this analysis are available in (Appendix K). The results of Scheffé's method indicate that there was no significant difference in barriers among the experience categories.

Table 4.23: 3-way Factorial ANOVA of Factors Impeding**Tests of Between-Subjects Effects**

Dependent Variable: BARRIERS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	14.595 ^a	15	.973	1.416	.142	.091
Intercept	1276.858	1	1276.858	1857.599	.000	.898
Sex	3.744	1	3.744	5.447	.021	.025
Afield	2.034	1	2.034	2.959	.087	.014
Experien	1.498	3	.499	.727	.537	.010
Sex * Afield	.786	1	.786	1.143	.286	.005
Sex * Experien	3.054	3	1.018	1.481	.221	.021
Afield * Experien	.257	3	.086	.125	.946	.002
Sex * Afield * Experien	2.626	3	.875	1.273	.284	.018
Error	145.035	211	.687			
Total	1815.000	227				
Corrected Total	159.630	226				

a. R Squared = .091 (Adjusted R Squared = .027)

Summary of the findings:

This study includes two statistical techniques: descriptive and inferential statistics. These statistical results highlight the sample characteristics and significant findings of this study. The sample characteristics show that this study contained 227 participants: a majority of participants based on sex were female (55.9%), based on academic field were from the academic field of science (59.5%), and based on experience had more than 15 years of teaching experience (40.5%).

The following characteristics show the main descriptive features of the four dependent variables (technological expertise, e-learning usage, motivational

factors, and barriers). Technological expertise is divided here into two categories (general and specific expertise). With regard to general expertise, this study found that the majority of participants had a positive sense of technological expertise and categorized themselves as "proficient" (51.1%). An analysis of the three highest (using a computer to find resources from the university library, using a word processor to create documents, and using presentation software) and three lowest (website design, use of electronic bulletin board, use video conferencing) items of specific expertise shows that the participants had a positive sense of technological expertise in traditional technology usage but did not have the same sense of expertise regarding advanced technology usage.

For current use, this study also found that the majority of participants (63.4%) "seldom" use technology, and the use of technology followed the same pattern of having the three highest items (use of internet research and searches, use of computer software for handouts or lecture notes, and use of presentation software in the classroom) based on traditional technology usage and the three lowest items (use of electronic conferencing; use of personally designed web-based lectures, notes, or tutorials

(see Table 4.24); and use of personally designed web-based tests or quizzes) based on advanced technology usage.

Overall, the frequency of the participant responses for the motivational factors was positive (78.5% chose "encouraging" or "highly encouraging"). The overall mean score for motivational factors was 2.99 out of 4.00 and supports this finding. The motivational factors were also defined as being extrinsic or intrinsic. The top two motivational factors (see Table 4.25) were defined as intrinsic factors in this study. Thus, this study finds that motivational factors are influential, and the most influential motivational factors are intrinsic.

Similarly, the frequency of the participant responses for the barrier factors was positive (64.7% chose "some barriers" or "many barriers"). The overall mean score for barrier factors was 2.70 out of 4.00 and supports this finding. Like the motivational factors, the barrier factors were also defined as being extrinsic or intrinsic. However, unlike the motivational factors, all of the top barrier factors (see Table 4.26) were defined as extrinsic factors in this study. Thus, this study finds that barrier factors are influential, and the most influential barrier factors are extrinsic.

The factor analysis was conducted at the beginning to investigate and explore the variables and to improve the questionnaires of the research. The results of the factor analysis were coincided with the findings of the descriptive technique.

There is a significant difference in the general expertise of instructors based on all three independent variables as shown by the main effect: sex ($F = 10.244$; $P = 0.002$), academic field ($F = 6.752$; $P = 0.010$) and experience ($F = 3.078$; $P = 0.029$). The interaction of the factors of sex and academic field and the factors of academic field and experience also showed a significant difference in general expertise: sex and academic field ($F = 8.989$; $P = 0.003$) and academic field and experience ($F = 3.540$; $P = 0.016$). The other interactions did not show a significant difference in general expertise.

For specific expertise of instructors based on the main effect of the three independent variables, only sex showed a significant difference: $F = 18.230$; $P = 0.000$. In addition, only two interactions showed a significant difference in specific expertise: the interaction of sex and academic field ($F = 7.216$; $P = 0.008$) and the interaction of academic field and experience ($F = 2.998$; P

= 0.032). The other interactions did not show a significant difference in specific expertise.

Like specific expertise, the only independent variable that showed a significant difference in current use was sex ($F = 22.594$; $P = 0.000$). In addition, only two interactions showed a significant difference in current use: the interaction of sex and academic field ($F = 12.802$; $P = 0.000$) and the interaction of academic field and experience ($F = 3.644$; $P = 0.014$). The other interactions did not show a significant difference in current use.

For motivational factors, no significant differences exist in terms of the main effects or the interactions.

For barrier factors, there is only a significant difference in terms of the main effect of sex ($F = 5.447$; $P = 0.021$).

CHAPTER (V)

Summary, Conclusions, and Recommendations

Summary of the study

The purpose of the study was to determine whether significant differences exist among instructors from King Abdulaziz University's (KAU) Humanities and Scientific Colleges concerning their perceived levels of expertise and current use of e-learning technologies as part of their teaching. In addition, the interactions between the independent factors of sex, academic field, and teaching experience were analyzed in relation to their effect on the dependent factors. The results of this study are examined below, and recommendations are suggested for future applications and research.

Research Design and Procedure

Three techniques of statistics, including factor analysis, descriptive and inferential statistics, were used to answer the research questions. For the first set of research questions, descriptive statistics were used: specifically, frequencies, means, percentages, and standard deviation. Inferential statistics were used to answer the second set of research questions: a 3-way Factorial ANOVA (2x2x4) and a Scheffe's post hoc test were conducted. This

study had four dependent variables: 1) expertise of technology, 2) current use of e-learning, 3) motivational factors, and 4) barriers. There were three independent variables in the study: (A) sex (male and female), (B) academic field (scientific and humanities), and (C) years of teaching experience (0-5, 6-10, 11-15, and 15+).

The population of the study consisted of roughly 2000 instructors from the King Abdulaziz University (KAU) in Saudi Arabia during the academic year of 2007-2008. The participation in the study was voluntary, and the survey questionnaire was distributed to a randomly selected sample of professors in the science and humanities colleges at KAU. The participants totaled 227 from the KAU Jeddah men's and women's campus. Male participants represent (44.1%) and female participant represent (55.9%); a majority of participants based on academic field were from the academic field of science: 59.5% of the sample size of the study.

Conclusions

This section presents the findings of the study and a discussion of those findings. Based on the findings of the descriptive and inferential statistical analyses, the effect of independent instructor characteristics on dependent factors of e-learning was examined.

The following characteristics show the main descriptive features of the four dependent variables (technological expertise, e-learning usage, motivational factors, and barriers). Technological expertise was divided into two categories (general and specific expertise). With regard to **general expertise**, this study found that the majority of participants had a positive sense of technological expertise and categorized themselves as "proficient" (51.1%). An analysis of the three highest areas of specific expertise (using a computer to find resources from the university library, using a word processor to create documents, and using presentation software) and three lowest areas of specific expertise (website design, use of electronic bulletin board, use video conferencing) revealed that the participants had a positive sense of technological expertise in traditional technology usage but did not have the same sense of expertise regarding advanced technology usage. These findings are compatible with findings from other studies that targeted instructors' technological expertise ((Lane & Yamashiro, 2006); Arabasz et al., 2003).

There were significant differences in the general expertise of instructors based on all three independent variables as shown by the main effect: sex ($F = 10.244$; $P =$

0.002), academic field ($F = 6.752$; $P = 0.010$) and experience ($F = 3.078$; $P = 0.029$). The interaction of the factors of sex and academic field and the factors of academic field and experience also showed a significant difference in general expertise: sex and academic field ($F = 8.989$; $P = 0.003$) and academic field and experience ($F = 3.540$; $P = 0.016$). The (AxBxC) interactions did not show a significant difference in general expertise. This finding is in accordance with previous studies that have shown that males report a higher overall level of expertise (Lane & Yamashiro, 2006).

Regarding the **specific expertise** of instructors based on the main effect of the three independent variables, only sex showed a significant difference: $F = 18.230$; $P = 0.000$. In addition, only two interactions showed a significant difference in specific expertise: the interaction of sex and academic field ($F = 7.216$; $P = 0.008$) and the interaction of academic field and experience ($F = 2.998$; $P = 0.032$). The other interactions did not show a significant difference in specific expertise. These findings agree with earlier studies that concerned areas of specific expertise and showed that males indicate a higher specific levels of expertise (Lane & Yamashiro, 2006).

Regarding **current use**, this study also found that the majority of participants (63.4%) "seldom" use technology, and the use of technology followed the same pattern of having the three highest items (use of internet research and searches, use of computer software for handouts or lecture notes, and use of presentation software in the classroom) based on traditional technology usage and the three lowest items (use of electronic conferencing; use of personally designed web-based lectures, notes, or tutorials; and use of personally designed web-based tests or quizzes) based on advanced technology usage. The higher use and expertise of the instructors with traditional technology rather than advanced technology reveals that advanced technologies have not yet become commonplace in e-learning.

Like specific expertise, the only independent variable that showed a significant difference in **current use** was sex ($F = 22.594$; $P = 0.000$). In addition, only two interactions showed a significant difference in current use: the interaction of sex and academic field ($F = 12.802$; $P = 0.000$) and the interaction of academic field and experience ($F = 3.644$; $P = 0.014$). The other interactions did not show a significant difference in current use. The findings related to sex are compatible with findings from other

studies that showed the effect of sex on an instructors' use of e-learning (Betts 1998; Lane & Yamashiro, 2006; Russell & Bradley, 1997; Yuen & Ma, 2002; So & Swatman, 2006).

Overall, the frequency of the participant responses for the **motivational factors** was positive (78.5% chose "encouraging" or "highly encouraging"). The overall mean score for motivational factors was (2.99) out of (4.00) and supports this finding. The motivational factors were also defined as being extrinsic or intrinsic. The top three motivational factors include 1) personal computer skills, 2) the opportunity to improve teaching, and 3) classroom technology infrastructure (e.g., wiring, computers, or projectors), and the lower three motivational factors include 1) Support and encouragement from peers, 2) Opportunity to reach new audiences that can not attend classes on campus, and 3) Credit toward promotion and tenure. In addition, motivational factors showed that no statistically significant differences exist in terms of the main effects or the interactions with three independent variables. These factors were also analyzed in terms of being extrinsic or intrinsic, and the top two motivational factors were found to be intrinsic. These results show that intrinsic motivational factors are more important than

extrinsic factors in encouraging an instructor to adopt and use e-learning. Although intrinsic factors were the most important, extrinsic factors were also important and should not be discounted. In order to provide proper motivation for instructors to use e-learning, they should be encouraged with intrinsic as well as extrinsic factors. This finding is in accordance with the findings of the literature review in this study, e.g. (Taylor & White, 1991; Lonsdale, 1993; Betts, 1998; Maguire 2005).

Similarly, the frequency of the participant responses for the **barrier factors** was positive (64.7% chose "some barriers" or "many barriers"). The overall mean score for barrier factors was 2.70 out of 4.00 and supports this finding. Like the motivational factors, the barrier factors were also defined as being extrinsic or intrinsic. However, unlike the motivational factors, all of the top barrier factors (see Table 4.11) were defined as extrinsic factors in this study. Thus, this study finds that barrier factors are influential, and the most influential barrier factors are extrinsic. For barrier factors, there is only a significant difference in terms of the main effect of sex ($F = 5.447$; $P = 0.021$). These findings are compatible with findings from other studies (Meyers, 2000b; Betts, 1998).

Recommendations

In order for e-learning to be successful in higher education, e-learning technologies must be made more meaningful and integrative in the teaching and learning conducted by instructors at King AbdulAziz University. This study reveals several areas of concern, identified by instructors, regarding e-learning. The following sections suggest recommendations for applications and future research to understand and use these problem areas to enhance the use of e-learning by instructors.

Recommendations for KAU Administration

This study makes three recommendations for KAU: 1) Improve the technological infrastructure. 2) Motivate instructors by offering acknowledgement for e-learning use. 3) Apply these changes to the entire university system. These three recommendations are discussed in further detail below.

The first recommendation of this study for improving the implementation of e-learning at KAU involves the most important barrier factor as identified by the instructors: technological infrastructure. The technological infrastructure consists of the resources (human and technical) that exist for e-learning in the university. With a proper technological infrastructure, the other two

to barriers (lack of student access and lack of technical support) will also be solved. In order to correct this problem, the university should provide the instructors with proper access and availability to the appropriate technology and resource staff to facilitate e-learning. Having the appropriate technology and resource staff available can encourage students and instructors with experience in e-technology or a desire to use e-technology to consider this university.

E-learning is an interrelated process, and all of the various aspects of e-learning (expertise, motivation, use, etc...) influence one another. By improving the barriers that are identified by the instructors, the administration may also improve other areas of concern. As identified by the instructors, technological infrastructure is a weakness at KAU, and this problem may have caused other problems that were observed in the results of this study. For example, the lack of a proper infrastructure may have been the cause of the reported lack of use by the instructors. Perhaps with a better infrastructure, the instructors would show a higher level of use for e-learning.

Due to the fact that most of the barriers were extrinsic, these problems can be solved with environmental improvements such as the improvement of the technological

infrastructure. Some of the motivational factors were also extrinsic, and the factors that were identified (such as classroom technology) would all be enhanced with improved technological infrastructure. However, many of the important motivational factors were intrinsic.

The second recommendation of this study is that universities can focus on these motivational factors to encourage instructors to at least try new technologies in the classroom. For instance, universities could provide awards or acknowledgements for outstanding e-learning integration or consider e-learning use when evaluating the instructors. As this study mentions earlier in this section, e-learning is an interrelated process, and administrators should consider both extrinsic and intrinsic factors as they integrate e-learning into university programs.

The third and final recommendation of this study is these changes need to be applied to the entire university system. Due to the fact that this study shows an effect of sex and academic field on e-learning expertise and use (in the case of sex), the university should make an effort to improve e-learning integration for the entire system without focusing on any specific group or program. Thus, this study recommends that to improve the problem areas in

e-learning identified by the instructors, administrators should improve both extrinsic and intrinsic factors for the entire system.

Recommendation for Future Research

This study offers opportunities and pathways for future research to more fully examine other variables and factors that may contribute to or influence the use, expertise, motivational factors, and barriers of instructors to e-learning. First, this research presented four limitations as mentioned in Chapter 1; future research should consider these limitations as points of study to determine whether they are creating confounding effects in this experiment.

In addition, this study was conducted quantitatively, and perhaps a qualitative study would provide more insight into the findings expressed here. A qualitative study could include interviews with the instructors or a case study of KAU with a focus on e-learning. This type of a study could provide further insight into the problem of e-learning use in the university and may be able to help further focus future research.

This study only observes the areas where an effect occurred, but this study does not evaluate the cause of

those effects. For example, sex and academic field showed a significant difference with expertise, and sex showed a significant difference with use. It is the recommendation of this study that future studies focus on the causes of these discrepancies in order to find more solutions for solving these problems with future e-learning systems.

The final recommendation for future research provided by this study concerns government and administrators. This study recommends that government and university administrators be studied to determine their readiness for and attitudes toward e-learning. These two variables are important when considering the implementation of e-learning into the educational system, and the results of this research may identify causes for the problems observed with the instructors.

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Appendix A: Survey Form (English Version)

Dear participant:

This survey is conducted in partial fulfillment of a doctoral study in the major of curriculum and instruction at West Virginia University. The study seeks to investigate E-learning technologies currently implemented for higher education at King Abdulaziz University (KAU) at Jeddah, Saudi Arabia. Of particular interest are the modes, levels, and influencing factors for the usage among current instructors. This effort is expected to significantly assist KAU in the design of programs targeted at supporting current instructors, encouraging them to use such technologies, as well as facilitating the process of coping with technological advancement.

Please take the time necessary to complete this survey, keeping in mind that your response should be both accurate and representative of your opinion. The survey is composed of three sections: the first section pertains to demographic information; the second section is to determine the scale of general and specific current expertise for E-learning technologies; and the third section is concerned with determining external factors affecting E-learning (e.g. motivational factors, and factors impeding). Mark your response in the first section with a (✓) . Responses for the second and third sections should be in the form of selecting the appropriate number.

In conclusion, I would like to stress that completing this survey is entirely voluntary, and you have the right to refuse participation in this study. Neither your grades nor your academic status will be jeopardized if you choose not to participate in this study. Additionally, you can omit the response for any question you do not feel comfortable answering. In the event that you choose to complete the survey, your responses will be kept confidential and solely utilized for research purposes. The survey time is estimated at 15 minutes. Please return the completed survey in the attached envelope, and kindly place the envelope in the designated box.

Should you have any questions, please contact me at: salbalwi@mix.wvu.edu

Sincerely

Salem A. Albalwi

Ed D candidate

Department of curriculum theory & practice

College of Human Resources and Education

West Virginia University

The objective of this survey is to identify factors that influence instructors' use of e-learning technologies in their teaching. PLEASE DO NOT IDENTIFY YOURSELF ON THIS SURVEY. ALL INDIVIDUAL RESPONSES WILL REMAIN CONFIDENTIAL. ONLY THE AGGREGATE RESULTS WILL BE REPORTED. Thank you for participating in this survey.

Part I: Demographics

Please check only one answer for each item, which applies to you.

Sex: ☐ Male ☐ Female

The kind of college in which you teach it:

☐ Scientific college ☐ Humanities college.

How many years of teaching experience in higher education?

☐ 0- 5 Years ☐ 6- 10 Years ☐ 11- 15 Years ☐ Over 15 years

Part II: E-learning knowledge:

Knowledge: You will be asked a variety of questions about e-learning. Before responding think about your own level of expertise related to e-learning. Keep these definitions in mind as you answer the following questions.

Novice: the ability to use only one or two programs if someone else installs them and is available to help (e.g., creating basic student handouts).

Intermediate: able to use at least two selected programs, access email, and use the Internet (e.g., send information by email to the whole class).

Proficient: the ability to use a variety of software, and to accomplish a variety of tasks, such as word processing, spreadsheets, database, presentation software, web authoring software, and Internet applications (e.g., using Front Page to create a web page).

Expert: knowledge of programming, able to install new applications, to troubleshoot software issues, ability to learn from manuals, and to use different platforms (e.g., helping students in solving technical problems).

1) Which of the following best describes your level of expertise as an electronic technology user?

- 1) -Don't use ☐ 2) –Novice ☐ 3) –Intermediate ☐
4) – Proficient ☐ 5) – Expert ☐

2) Which of the following best describes your current expertise with each type of e-learning technologies? (Please check only one response for each item)

Option "0"(D.U.) Don't Use Option "1" (N) Novice Option "2" (I)Intermediate Option "3" (P) Proficient Option "4" (E) Expert.						
N	Items	D.U.	N	I	P	E
1	Use a word processor to create documents.	0	1	2	3	4
2	Use a spreadsheet to create charts and graphs.	0	1	2	3	4
3	Use a computer to find resources from the university library.	0	1	2	3	4
4	Searching the web to find information and resources.	0	1	2	3	4
5	Use a database software to set up and access information.	0	1	2	3	4
6	Use presentation software (e.g., PowerPoint).	0	1	2	3	4
7	Use graphic software to create illustrations, slides, or images.	0	1	2	3	4
8	Use audio/video clips software to create or enhance presentations.	0	1	2	3	4
9	Website design.	0	1	2	3	4
10	Use a computer to communicate with others.	0	1	2	3	4
11	Use of electronic bulletin board.	0	1	2	3	4
12	Use video conferencing	0	1	2	3	4

3) Please select the response option (**1 = Never, 2= Seldom, 3 = Occasionally, 4 = Often, 5 = Almost all the time**) that best describes the frequency of your use of each of the following e-learning technologies that you used **the past semester**.

<i>0=Never (0%)</i>		<i>1=Seldom (1-25%)</i>		<i>2=Occasionally (26-50%)</i>		<i>3=Often (51-75%)</i>		<i>4=Almost all the time (76-100%)</i>	
N	Items	Never	Seldom	Occasionally	Often	Almost			
1	Use of computer software for handouts or lecture notes.	0	1	2	3	4			
2	Use Email as the primary source of student contact outside the classroom.	0	1	2	3	4			
3	Hold virtual office hours.	0	1	2	3	4			
4	Use of presentation software in the classroom.	0	1	2	3	4			
5	Use On-line bulletin board.	0	1	2	3	4			
6	Use personally designed Web-based lectures, notes, or tutorials.	0	1	2	3	4			
7	Use personally designed Web-based tests or quizzes.	0	1	2	3	4			
8	Provided web-based grades.	0	1	2	3	4			
9	Used Internet research and searches.	0	1	2	3	4			
10	Posting required readings on course web page.	0	1	2	3	4			
11	Use On-line Chat room	0	1	2	3	4			
12	Commenting on course work electronically.	0	1	2	3	4			
13	Electronics conferencing.	0	1	2	3	4			
14	Use video tapes for instruction.	0	1	2	3	4			
15	Use audio tapes for instruction.	0	1	2	3	4			

Part III: Factors that motivate or impede instructors' use e-learning in their teaching.

1- Please indicate the extent to which the following factors motivate to your use of e-learning techniques in your instruction, according to the following scale:

Highly Discouraging (HD) Discouraging (D) Not a Factor (NF) Encouraging (E) Highly Encouraging (HE)						
N	Items	HD	D	NF	E	HE
1	Requirement by department or university	0	1	2	3	4
2	Administrative encouragement and support	0	1	2	3	4
3	Technical support in solving computer problems	0	1	2	3	4
4	Support and encouragement from peers	0	1	2	3	4
5	Access to software tools for enhancing teaching with technology	0	1	2	3	4
6	Credit toward promotion and tenure	0	1	2	3	4
7	Professional prestige and status	0	1	2	3	4
8	Training programs and support	0	1	2	3	4
9	Reduced teaching load.	0	1	2	3	4
10	Opportunity to improve teaching	0	1	2	3	4
11	Rewards/recognition for innovation in teaching	0	1	2	3	4
12	Time available to learn/pursue the integration of e-learning technologies	0	1	2	3	4
13	Increase in salary.	0	1	2	3	4
14	Opportunity to reach new audience that can not attend classes on campus.	0	1	2	3	4
15	Opportunity for scholarly pursuit	0	1	2	3	4
16	Funding for materials/expenses	0	1	2	3	4
17	Classroom technology infrastructure (e.g., wiring , computers, or projectors)	0	1	2	3	4
18	Resources about how to apply technology in teaching.	0	1	2	3	4
19	Student' access to resources	0	1	2	3	4
20	Student' computer skills	0	1	2	3	4
21	My computer skills	0	1	2	3	4
22	My colleagues' computer skills	0	1	2	3	4
23	Opportunity to enhance communication with others.	0	1	2	3	4

2- Please indicate the extent to which the following factors impede to your use of e-learning techniques in your instruction, according to the following scale:

<i>0=(NB)No barriers (0%) 1=(FB)very few barriers (1-25%)</i> <i>2=few barriers (26-50%) 3=some barriers (51-75%)</i> <i>4= many barrier (76-100%)</i>						
N	Items					
1	Lack of interest.	0	1	2	3	4
2	Lack of time to learn new technology	0	1	2	3	4
3	Negative comments made by colleagues about e-learning technologies.	0	1	2	3	4
4	Lack of support and encouragement from administrative.	0	1	2	3	4
5	Lack of support and encouragement from peers.	0	1	2	3	4
6	Lack of instructors' technological knowledge.	0	1	2	3	4
7	Lack of students' technological knowledge.	0	1	2	3	4
8	Lack of training programs.	0	1	2	3	4
9	Lack of face-to-face interaction in e-learning courses.	0	1	2	3	4
10	Lack of credit toward promotion and tenure.	0	1	2	3	4
11	Lack of funding for materials/expenses.	0	1	2	3	4
12	Lack of rewards/recognition for innovation in teaching	0	1	2	3	4
13	Concern about course quality.	0	1	2	3	4
14	Lack of technical support in solving computer problems.	0	1	2	3	4
15	Lack of technological infrastructure.	0	1	2	3	4
16	Lack of Student' access to resources.	0	1	2	3	4
17	Lack of resources about how to apply technology in teaching.	0	1	2	3	4
18	Security concerns.	0	1	2	3	4

Thank you for your time

Appendix B: Survey Form (Arabic Version)

بسم الله الرحمن الرحيم

الترميز:-----

العوامل الداخلية والخارجية المؤثرة في استخدام أعضاء هيئة التدريس للتعليم الإلكتروني

عزيزي المشارك بالاستبانة،

السلام عليكم ورحمة الله وبركاته،،،

هذا الاستبانة جزء من دراسة لنيل الدكتوراة بقسم المناهج وطرق التدريس بجامعة وست فرجينيا في الولايات المتحدة الأمريكية. وتسعى هذه الدراسة لمعرفة أنواع تقنيات التعليم الإلكتروني المستخدمة حالياً للتدريس الجامعي، ومستوى استخدام هذه التقنيات، والعوامل المؤثرة على استخدام أعضاء هيئة التدريس لهذه التقنيات في جامعة الملك عبدالعزيز بجدة في المملكة العربية السعودية. وذلك لمساعدة الجامعة في تصميم برامج لدعم أعضاء هيئة التدريس وتشجيع على استخدام هذه التقنيات، وتذليل الصعوبات التي تواجههم لمواكبة التطور التقني.

أمل التكرم بتعبئة هذا الاستبانة حيث تكون إجابتك دقيقة ومعبرة عن رأيك. ان هذه الاستبانة مكونة من ثلاث أجزاء. الأول منها يتعلق بالمعلومات الشخصية للمشارك، والجزء الثاني هو مقياس لمستوى الخبرة بشكل عام وخاص ومقياس لمستوى الاستخدام الحالي للتعليم الإلكتروني. أما الجزء الثالث فهو مقياس للعوامل المؤثرة على استخدام التعليم الإلكتروني (عوامل محفزة، عوامل معيقة). أن الإجابة بالجزء الأول ستكون بوضع علامة (√) بجانب العبارة المناسبة، أما الجزء الثاني والثالث فهو باختيار الرقم المناسب للمقياس.

وفي الختام أود التأكيد على أن تعبئة هذه الاستبانة اختيارية ولك الحق بعدم تعبئتها، كما لك الحق في عدم الإجابة على أي سؤال لا تود الإجابة عليه. وفي حال رغبتك المشاركة بهذه الدراسة، فإن بيانات هذه الاستبانة ستكون سرية، وفي الغالب لن تستغرق أكثر من 15 دقيقة. يرجع إعادة الاستبيان من خلال وضعها في المغلف المرفق ثم وضعها في الصندوق المغلق في قسمك.

عند وجود أي استفسار أو سؤال، يرجى الكتابة لي عبر البريد الإلكتروني على العنوان التالي:

salbalwi@mix.wvu.edu

شاكرين لكم مقدماً تعاونكم وحسن استجابتكم.

ولكم صادق التحية.

الباحث / سالم عبدالرحمن البلوي

الجزء الأول : المعلومات الشخصية:-

فضلا ضع اشارة (√) أمام العبارة المناسبة :

أنثى ☐ ذكر ☐ الجنس:

الكلية التي تدرّس بها:

كلية إنسانية ☐ كلية علمية ☐

عدد سنوات الخبرة التي أمضيتها في التدريس الجامعي:

سنوات 0 , 5 ☐

سنوات 6 , 10 ☐

سنة 11 , 15 ☐

سنة 15 أكثر من ☐

الجزء الثاني: معارف التعليم الإلكتروني (مستوى الخبرة العامة , مستوى الخبرة الخاصة, مستوى الاستخدام الحالي).

في ما يلي بعض التعريفات التي ستساعدك على تحديد مستوى خبرتك العامة في التعليم الإلكتروني :

مبتدئ : القادر على استخدام برنامج أو برنامجين تم تحميلهما بواسطة شخص آخر مع بقاء هذا الشخص مساعداً ً إذا لزم الأمر, كـ (القدرة على طباعة ورقة عمل لتوزيعها على الطلاب).
متوسط: القادر على استخدام برنامجين أو أكثر كاستخدام الإنترنت و البريد الإلكتروني, كـ (ارسال معلومات للطلاب عن طريق البريد الإلكتروني).

متقدم: القادر على استخدام عدد من البرامج المختلفة والقيام بمهام متعددة, كـ (استخدام برنامج معالج الكلمات, والجداول الإلكترونية , وقواعد البيانات, و برامج العرض , برامج التصميم, وتطبيقات الإنترنت).

خبير: القادر على ادخال البرامج والتطبيقات المختلفة بالحاسوب و وتحميلها, والإلمام بمهارات البرمجة ومساعدة الطلاب على حل المشكلات التقنية.

أ- حدد مستوى خبرتك العامة في استخدام الحاسوب:

1- لا أستخدّم ☐ 2- مبتدئ ☐ 3- متوسط ☐ 4- متقدم ☐ 5- خبير ☐

ب - ماهو مستوى خبرتك الحالية في استخدام كلا من البرامج والتطبيقات التالية:

الرقم	الفقرات	لا أستخدام	مبتدئ	متوسط	متقدم	خبير
1	استخدام معالج النصوص كـ (الورد) لتصميم أوراق عمل الطلاب	0	1	2	3	4
2	استخدام الجداول الإلكترونية لتصميم جداول ورسومات بيانية	0	1	2	3	4
3	استخدام شبكة الإنترنت للحصول على معلومات أو مراجع متنوعة	0	1	2	3	4
4	استخدام قواعد البيانات للحصول على المعلومات	0	1	2	3	4
5	استخدام الحاسوب للحصول على مراجع ومصادر علمية من مكتبة الجامعة	0	1	2	3	4
6	استخدام برامج العرض كـ (بوربوينت)	0	1	2	3	4
7	استخدام الحاسوب لتصميم صور ورسومات إيضاحية	0	1	2	3	4
8	استخدام برامج الحاسوب المسموعة أو المرئية لزيادة فعالية العملية التعليمية	0	1	2	3	4
9	تصميم موقع إلكتروني	0	1	2	3	4
10	استخدام الحاسوب للاتصال بالآخرين والتفاعل معهم	0	1	2	3	4
11	استخدام لوحة الإعلانات الإلكترونية	0	1	2	3	4
12	استخدام المؤتمرات المرئية	0	1	2	3	4

ج - حدد مستوى استخدامك لتقنيات التعليم الإلكتروني خلال الفصل الدراسي حسب المقياس المحدد بالنسبة المئوية التالي:

0 = لا استخدم (0%) 1 = نادرا (1- 25 %) 2 = أحيانا (26- 50 %) 3 = غالبا (51- 75 %) 4 = دائما (76- 100 %)						
الرقم	الفقرات	لا استخدم	نادرا	أحيانا	غالبا	دائما
1	استخدام برامج الحاسوب لتحضير خطط المادة وتصميم النشرات وأوراق العمل	0	1	2	3	4
2	استخدام البريد الإلكتروني للتواصل مع الطلاب خارج قاعة المحاضرات	0	1	2	3	4
3	عقد ساعات مكتبية افتراضية	0	1	2	3	4
4	استخدام برامج العرض في قاعة المحاضرات	0	1	2	3	4
5	استخدام لوحة الإعلانات الإلكترونية	0	1	2	3	4
6	عقد محاضرات بواسطة الإنترنت	0	1	2	3	4
7	عقد اختبارات بواسطة الإنترنت	0	1	2	3	4
8	تزويد الدرجات على موقع المادة الإلكتروني	0	1	2	3	4
9	استخدام الإنترنت في عمليات البحث	0	1	2	3	4
10	عرض القراءات المطلوبة على موقع المادة الإلكتروني	0	1	2	3	4
11	استخدام غرف الحوار على الشبكة	0	1	2	3	4
12	التعليق على الواجبات وأوراق العمل إلكترونيا	0	1	2	3	4
13	المؤتمرات الإلكترونية	0	1	2	3	4
14	استخدام الأشرطة المرئية بالتدريس	0	1	2	3	4
15	استخدام الأشرطة المسموعة بالتدريس	0	1	2	3	4

الجزء الثالث: العوامل المؤثرة في استخدام تقنيات التعليم الإلكتروني (عوامل محفزة , عوامل معيقة):
أ - العوامل المحفزة:

إلى أي مدى تشجعك كل من العوامل التالية على استخدام تقنيات التعلم الإلكتروني في العملية التعليمية:

الرقم	الفقرات	غير مشجع	غير	محايد	مشجع	مشجع
1	إلزام الجامعة لهيئة التدريس باستخدام تقنيات التعليم الإلكتروني.	0	1	2	3	4
2	الدعم والتشجيع من عمادة الكلية أو إدارة الجامعة	0	1	2	3	4
3	توفر المساعدة التقنية لحل المشاكل المتعلقة بأجهزة الحاسوب	0	1	2	3	4
4	دعم الزملاء وتشجيعهم	0	1	2	3	4
5	توفر المواد والبرامج التقنية اللازمة لزيادة فعالية التدريس	0	1	2	3	4
6	الحصول على ترقية أو منصب	0	1	2	3	4
7	كسب سمعة وظيفية متميزة	0	1	2	3	4
8	توفر برامج التدريب	0	1	2	3	4
9	تخفيف العبء الدراسي	0	1	2	3	4
10	زيادة فعالية العملية التعليمية	0	1	2	3	4
11	توفير المكافآت للمتميزين في هذا المجال	0	1	2	3	4
12	توفر الوقت الكافي لتعلم كيفية استخدام تقنيات التعليم الإلكتروني	0	1	2	3	4
13	زيادة الراتب	0	1	2	3	4
14	إتاحة الفرصة للتدريس عن بعد	0	1	2	3	4
15	إتاحة الفرصة لمتابعة البحث العلمي	0	1	2	3	4
16	توفر الدعم المالي لشراء المواد اللازمة	0	1	2	3	4
17	توفير البناء التحتي لقاءات المحاضرات مثل (الحاسبات، الشبكات، أجهزة عرض)	0	1	2	3	4
18	توفير المصادر حول كيفية استخدام التكنولوجيا في التدريس	0	1	2	3	4
19	توفر أجهزة الحاسوب والبرامج للطلاب	0	1	2	3	4
20	امتلاك الطلبة للمهارات اللازمة	0	1	2	3	4
21	امتلاكك للمهارات اللازمة لإستخدام الحاسوب	0	1	2	3	4
22	امتلاك زملائك للمهارات اللازمة	0	1	2	3	4
23	توفر فرص أكثر للتواصل مع الآخرين والتفاعل معهم	0	1	2	3	4

ب - العوامل المعيقة:

الى اي مدى تسهم كل من العوامل التالية في إعاقة استخدام تقنيات التعليم الإلكتروني في تدريسيك:

0 = لا تعيق (0 %) 1 = تعيق قليلا جدا (1-25 %) 2 = تعيق قليلا (26-50 %) 3 = تعيق (51-75 %) 4 = تعيق بشدة (76-100 %)					الرقم
لا تعيق	تعيق قليلا	تعيق قليلا	تعيق	تعيق	
0	1	2	3	4	1
0	1	2	3	4	2
0	1	2	3	4	3
0	1	2	3	4	4
0	1	2	3	4	5
0	1	2	3	4	6
0	1	2	3	4	7
0	1	2	3	4	8
0	1	2	3	4	9
0	1	2	3	4	10
0	1	2	3	4	11
0	1	2	3	4	12
0	1	2	3	4	13
0	1	2	3	4	14
0	1	2	3	4	15
0	1	2	3	4	16
0	1	2	3	4	17
0	1	2	3	4	18

ختاما: هل تود التعليق أو إضافة أي شيء آخر؟

شكرا على مشاركتك وتعاونك لتعبئة هذه الاستبانة.

Appendix C: English Form of the Survey Evaluation

Dear Participant,

The objective of this survey is to identify factors that influence instructors' use of e-learning technologies in the delivery of instruction. Please fill out the attached survey first and then complete the evaluation form by checking the most correct response for each item. Your responses will help improve the quality of the survey and put it in its final form to reflect the goal that it was designed to accomplish.

1. Time required completing the survey:

- ☐-Less than 10 minutes.
- ☐-From 10 to 15 minutes.
- ☐-From 15 to 20 minutes.
- ☐-More than 20 minutes

2. The survey's items were:

- ☐- Clear and easy to understand.
- ☐-Diffuse, but I could complete the survey.
- ☐-Not clear and hard to understand.

3. When I read the survey, I found that:

- ☐-All the words were clear and understandable.
- ☐-Some words were not clear, but they did not influence my answers.
- ☐-Some words were completely unclear and influenced my answers.

4. Please circle the number of items that you found it difficult to understand and provide your suggestion or comments to help making it more clear and understandable.

Part I : Demographic Items:

Item N: 1, 2, 3.

Suggestions or Comments:

Suggestions or Comments:

[illegible][illegible]

Thank you for your time.

Appendix D: Arabic Form of the Survey Evaluation

بسم الله الرحمن الرحيم

نموذج تقييم الاستبانة

عزيزي المشارك بالاستبانة:

السلام عليكم ورحمة الله وبركاته،،

هدفُ هذه الاستبانة هو جمعُ بياناتٍ عن العوامل المؤثرة على استخدام أعضاء هيئة التدريس الجامعي لتقنيات التعليم الإلكتروني في تدريسهم وتحديد مستوى مهارتهم ومستوى استخدامهم الحالي. يرجى تعبئة الاستبانة أولاً ومن ثم تعبئة نموذج تقييم هذه الاستبانة وذلك باختيار الإجابة المناسبة لكل فقرة. الإجابة تكونُ بوضع علامة "صح" بجانب الإجابة المناسبة، وكذلك الإجابة على كل ما يلزم بدقة قدر الإمكان. اجابتك ستساعدُ على تحسين جودة الاستبانة ووضعها في صيغتها النهائية بحيث تعكس الهدف المرجو منها. شاكرين لكم تعاونكم ومساعدتكم.

أولاً: الوقت الذي استغرقته الإجابة على الاستبانة:

- ☐ أقل من 10 دقائق ☐ من 10 دقائق إلى 15 دقيقة
- ☐ من 15 دقيقة إلى 20 دقيقة ☐ أكثر من عشرين دقيقة

ثانياً: فقرات الاستبانة كانت:

☐ واضحة وسهلة الفهم والمتابعة

☐ كثيرة، ولكن أمكنني الفهم ومواصلة الإجابة على الاستبانة

☐ غير مفهومة وغير واضحة ومن الصعب استيعابها والإجابة عليها

ثالثاً: عند قراءتي مفردات الاستبانة، وجدت أن:

☐ كل مفردات الاستبانة واضحة وسهلة الفهم

☐ بعض مفرداته غير مفهومة، ولكنها ماكانت لتأثر على قدرتي على الإجابة

☐ بعض المفردات لم تكن واضحة بحيث أثرت على قدرتي على الإجابة

رابعاً: يرجى وضع دائرة حول رقم الفقرة أو أرقام الفقرات التي وجدت صعوبة في فهمها، وكتابة تعليق أو اقتراح للمساعدة بجعل الفقرة أو الفقرات أكثر وضوحاً وفهماً.

الجزء الأول: المعلومات الشخصية:

رقم الفقرة : 1 2 3

التعليق أو المقترح:

الجزء الثاني:

أ- المستوى العام للمعرفة (المهارة).

رقم الفقرة: 1 2 3 4

التعليق أو المقترح:

ب- مقياس المستوى الخاص للمعرفة (المهارة).

رقم الفقرة: 1 2 3 4 5 6 7 8 9 10 11

12.

التعليق أو المقترح:

ج- مقياس مستوى الاستخدام الحالي لتقنيات التعليم الالكتروني

رقم الفقرة: 1 2 3 4 5 6 7 8 9 10 11

12 13 14 15 16 17 18 19 20 21 22

23.

التعليق أو المقترح:

الجزء الثالث:

أ- مقياس العوامل المحفزة لاستخدام التعليم الإلكتروني.

رقم الفقرة: 1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22

23.

التعليق أو المقترح:

ب- مقياس العوامل المعيقة لاستخدام التعليم الإلكتروني.

رقم الفقرة: 1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22

23.

التعليق أو المقترح:

خامساً: هل تود التعليق أو الاقتراح على الاستبانة بشكل عام أو إضافة شيء؟

انتهى نموذج تقييم الاستبانة، وشكراً جزيلاً على مساهمتك القيمة.

Appendix E: percentage of General Expertise by Academic field

Genral Expertise * Academic field Crosstabulation

			Academic field		Total
			scientific	Humanities	
Genral Expertise	Don't use	Count	0	4	4
		% within Genral Expertise	.0%	100.0%	100.0%
		% within Academic field	.0%	4.3%	1.8%
		% of Total	.0%	1.8%	1.8%
	Novice	Count	2	14	16
		% within Genral Expertise	12.5%	87.5%	100.0%
		% within Academic field	1.5%	15.2%	7.0%
		% of Total	.9%	6.2%	7.0%
	Intermediate	Count	42	23	65
		% within Genral Expertise	64.6%	35.4%	100.0%
		% within Academic field	31.1%	25.0%	28.6%
		% of Total	18.5%	10.1%	28.6%
	Proficient	Count	78	38	116
		% within Genral Expertise	67.2%	32.8%	100.0%
		% within Academic field	57.8%	41.3%	51.1%
		% of Total	34.4%	16.7%	51.1%
	Expert	Count	13	13	26
		% within Genral Expertise	50.0%	50.0%	100.0%
		% within Academic field	9.6%	14.1%	11.5%
		% of Total	5.7%	5.7%	11.5%
Total	Count	135	92	227	
	% within Genral Expertise	59.5%	40.5%	100.0%	
	% within Academic field	100.0%	100.0%	100.0%	
	% of Total	59.5%	40.5%	100.0%	

Appendix F: percentage of General Expertise by Sex

Genral Expertise * Sex Crosstabulation

			Sex		Total
			male	female	
Genral Expertise	Don't use	Count	0	4	4
		% within Genral Expertise	.0%	100.0%	100.0%
		% within Sex	.0%	3.1%	1.8%
		% of Total	.0%	1.8%	1.8%
	Novice	Count	8	8	16
		% within Genral Expertise	50.0%	50.0%	100.0%
		% within Sex	8.0%	6.3%	7.0%
		% of Total	3.5%	3.5%	7.0%
	Intermediate	Count	22	43	65
		% within Genral Expertise	33.8%	66.2%	100.0%
		% within Sex	22.0%	33.9%	28.6%
		% of Total	9.7%	18.9%	28.6%
	Proficient	Count	47	69	116
		% within Genral Expertise	40.5%	59.5%	100.0%
		% within Sex	47.0%	54.3%	51.1%
		% of Total	20.7%	30.4%	51.1%
	Expert	Count	23	3	26
		% within Genral Expertise	88.5%	11.5%	100.0%
		% within Sex	23.0%	2.4%	11.5%
		% of Total	10.1%	1.3%	11.5%
	Total	Count	100	127	227
		% within Genral Expertise	44.1%	55.9%	100.0%
		% within Sex	100.0%	100.0%	100.0%
		% of Total	44.1%	55.9%	100.0%

Appendix G: 3-way Factorial ANVA for General Expertise

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Sex	1	male	100
	2	female	127
Academic field	1	scientific	135
	2	Humanities	92
Experience	0	0-5	50
	1	6-10	42
	2	11-15	43
	3	15+	92

Descriptive Statistics

Dependent Variable: General Expertise

Sex	Academic field	Experience	Mean	Std. Deviation	N
male	scientific	0-5	2.88	.857	17
		6-10	2.40	.548	5
		11-15	2.90	.738	10
		15+	2.86	.705	28
		Total	2.83	.740	60
	Humanities	0-5	2.14	1.464	7
		6-10	3.15	.987	13
		11-15	3.00	.000	5
		15+	2.93	.961	15
		Total	2.88	1.042	40
	Total	0-5	2.67	1.090	24
		6-10	2.94	.938	18
		11-15	2.93	.594	15
		15+	2.88	.793	43
		Total	2.85	.869	100
female	scientific	0-5	2.61	.502	18
		6-10	2.73	.647	11
		11-15	3.00	.408	13
		15+	2.61	.556	33
		Total	2.69	.545	75
	Humanities	0-5	1.50	.926	8
		6-10	2.38	.650	13
		11-15	2.27	.961	15
		15+	2.13	1.088	16
		Total	2.13	.950	52
	Total	0-5	2.27	.827	26
		6-10	2.54	.658	24
		11-15	2.61	.832	28
		15+	2.45	.792	49
		Total	2.46	.785	127
Total	scientific	0-5	2.74	.701	35
		6-10	2.63	.619	16
		11-15	2.96	.562	23
		15+	2.72	.636	61
		Total	2.76	.640	135
	Humanities	0-5	1.80	1.207	15
		6-10	2.77	.908	26
		11-15	2.45	.887	20
		15+	2.52	1.092	31
		Total	2.46	1.053	92
	Total	0-5	2.46	.973	50
		6-10	2.71	.805	42
		11-15	2.72	.766	43
		15+	2.65	.818	92
		Total	2.63	.843	227

Levene's Test of Equality of Error Variances

Dependent Variable: General Expertise

F	df1	df2	Sig.
3.471	15	211	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

- a. Design: Intercept+Sex+Afield+Experien+Sex * Afield+Sex * Experien+Afield * Experien+Sex * Afield * Experien

Tests of Between-Subjects Effects

Dependent Variable: General Expertise

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	29.777 ^a	15	1.985	3.201	.000	.185
Intercept	1174.432	1	1174.432	1893.453	.000	.900
Sex	6.342	1	6.342	10.224	.002	.046
Afield	4.188	1	4.188	6.752	.010	.031
Experien	5.727	3	1.909	3.078	.029	.042
Sex * Afield	5.575	1	5.575	8.989	.003	.041
Sex * Experien	.713	3	.238	.383	.765	.005
Afield * Experien	6.588	3	2.196	3.540	.016	.048
Sex * Afield * Experien	.767	3	.256	.412	.744	.006
Error	130.875	211	.620			
Total	1736.000	227				
Corrected Total	160.652	226				

- a. R Squared = .185 (Adjusted R Squared = .127)

Estimated Marginal Means

1. Grand Mean

Dependent Variable: General Expertise

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
2.593	.060	2.476	2.711

2. Sex

Estimates

Dependent Variable: General Expertise

Sex	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
male	2.784	.092	2.602	2.966
female	2.403	.075	2.254	2.551

Pairwise Comparisons

Dependent Variable: General Expertise

(I) Sex	(J) Sex	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
male	female	.381*	.119	.002	.146	.616
female	male	-.381*	.119	.002	-.616	-.146

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: General Expertise

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	6.342	1	6.342	10.224	.002	.046
Error	130.875	211	.620			

The F tests the effect of Sex. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. Academic field

Estimates

Dependent Variable: General Expertise

Academic field	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
scientific	2.748	.079	2.592	2.904
Humanities	2.438	.089	2.263	2.614

Pairwise Comparisons

Dependent Variable: General Expertise

(I) Academic field	(J) Academic field	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
scientific	Humanities	.310*	.119	.010	.075	.545
Humanities	scientific	-.310*	.119	.010	-.545	-.075

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: General Expertise

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	4.188	1	4.188	6.752	.010	.031
Error	130.875	211	.620			

The F tests the effect of Academic field. This test is based on the linearly independent pair comparisons among the estimated marginal means.

4. Experience

Estimates

Dependent Variable: General Expertise

Experience	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
0-5	2.284	.122	2.044	2.524
6-10	2.666	.131	2.408	2.925
11-15	2.792	.131	2.533	3.050
15+	2.630	.087	2.459	2.802

Pairwise Comparisons

Dependent Variable: General Expertise

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
0-5	6-10	-.382*	.179	.034	-.735	-.029
	11-15	-.508*	.179	.005	-.860	-.155
	15+	-.346*	.150	.022	-.641	-.051
6-10	0-5	.382*	.179	.034	.029	.735
	11-15	-.125	.186	.501	-.491	.241
	15+	.036	.158	.819	-.274	.347
11-15	0-5	.508*	.179	.005	.155	.860
	6-10	.125	.186	.501	-.241	.491
	15+	.161	.157	.307	-.149	.471
15+	0-5	.346*	.150	.022	.051	.641
	6-10	-.036	.158	.819	-.347	.274
	11-15	-.161	.157	.307	-.471	.149

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: General Expertise

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	5.727	3	1.909	3.078	.029	.042
Error	130.875	211	.620			

The F tests the effect of Experience. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

5. Sex * Academic field

Dependent Variable: General Expertise

Sex	Academic field	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	scientific	2.760	.124	2.516	3.004
	Humanities	2.808	.137	2.537	3.078
female	scientific	2.736	.099	2.541	2.932
	Humanities	2.069	.113	1.846	2.292

6. Sex * Experience

Dependent Variable: General Expertise

Sex	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	0-5	2.513	.177	2.164	2.861
	6-10	2.777	.207	2.368	3.185
	11-15	2.950	.216	2.525	3.375
	15+	2.895	.126	2.647	3.144
female	0-5	2.056	.167	1.726	2.385
	6-10	2.556	.161	2.238	2.874
	11-15	2.633	.149	2.339	2.927
	15+	2.366	.120	2.129	2.602

7. Academic field * Experience

Dependent Variable: General Expertise

Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
scientific	0-5	2.747	.133	2.484	3.009
	6-10	2.564	.212	2.145	2.982
	11-15	2.950	.166	2.623	3.277
	15+	2.732	.101	2.532	2.931
Humanities	0-5	1.821	.204	1.420	2.223
	6-10	2.769	.154	2.465	3.074
	11-15	2.633	.203	2.232	3.034
	15+	2.529	.142	2.250	2.808

8. Sex * Academic field * Experience

Dependent Variable: General Expertise

Sex	Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
male	scientific	0-5	2.882	.191	2.506	3.259
		6-10	2.400	.352	1.706	3.094
		11-15	2.900	.249	2.409	3.391
		15+	2.857	.149	2.564	3.151
	Humanities	0-5	2.143	.298	1.556	2.730
		6-10	3.154	.218	2.723	3.584
		11-15	3.000	.352	2.306	3.694
		15+	2.933	.203	2.532	3.334
female	scientific	0-5	2.611	.186	2.245	2.977
		6-10	2.727	.237	2.259	3.195
		11-15	3.000	.218	2.569	3.431
		15+	2.606	.137	2.336	2.876
	Humanities	0-5	1.500	.278	.951	2.049
		6-10	2.385	.218	1.954	2.815
		11-15	2.267	.203	1.866	2.668
		15+	2.125	.197	1.737	2.513

Post Hoc Tests

Experience

Multiple Comparisons

Dependent Variable: General Expertise

Scheffe

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0-5	6-10	-.25	.165	.499	-.72	.21
	11-15	-.26	.164	.470	-.72	.20
	15+	-.19	.138	.588	-.58	.20
6-10	0-5	.25	.165	.499	-.21	.72
	11-15	-.01	.171	1.000	-.49	.47
	15+	.06	.147	.981	-.35	.48
11-15	0-5	.26	.164	.470	-.20	.72
	6-10	.01	.171	1.000	-.47	.49
	15+	.07	.145	.974	-.34	.48
15+	0-5	.19	.138	.588	-.20	.58
	6-10	-.06	.147	.981	-.48	.35
	11-15	-.07	.145	.974	-.48	.34

Based on observed means.

Homogeneous Subsets

General Expertise

Scheffé^{a,b,c}

Experience	N	Subset
		1
0-5	50	2.46
15+	92	2.65
6-10	42	2.71
11-15	43	2.72
Sig.		.423

Means for groups in homogeneous subsets are displayed.

Based on Type III Sum of Squares

The error term is Mean Square(Error) = .620.

- a. Uses Harmonic Mean Sample Size = 51.325.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.
- c. Alpha = .05.

Profile Plots

Estimated Marginal Means of General Expertise

Estimated Marginal Means of General Expertise

Appendix H: 3-way Factorial ANOVA for Specific Expertise

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Sex	1	male	100
	2	female	127
Academic field	1	scientific	135
	2	Humanities	92
Experience	0	0-5	50
	1	6-10	42
	2	11-15	43
	3	15+	92

Descriptive Statistics

Dependent Variable: SPECIFIC EXPERTISE

Sex	Academic field	Experience	Mean	Std. Deviation	N
male	scientific	0-5	2.71	.985	17
		6-10	2.00	.707	5
		11-15	2.90	.994	10
		15+	2.54	.838	28
		Total	2.60	.906	60
	Humanities	0-5	2.14	1.464	7
		6-10	3.23	.832	13
		11-15	3.00	1.000	5
		15+	2.33	.976	15
		Total	2.68	1.095	40
	Total	0-5	2.54	1.141	24
		6-10	2.89	.963	18
		11-15	2.93	.961	15
		15+	2.47	.882	43
		Total	2.63	.981	100
female	scientific	0-5	2.22	.943	18
		6-10	2.45	1.036	11
		11-15	2.23	.599	13
		15+	2.36	.859	33
		Total	2.32	.857	75
	Humanities	0-5	1.38	.518	8
		6-10	2.15	.689	13
		11-15	1.67	.900	15
		15+	1.69	1.078	16
		Total	1.75	.883	52
	Total	0-5	1.96	.916	26
		6-10	2.29	.859	24
		11-15	1.93	.813	28
		15+	2.14	.979	49
		Total	2.09	.909	127
Total	scientific	0-5	2.46	.980	35
		6-10	2.31	.946	16
		11-15	2.52	.846	23
		15+	2.44	.847	61
		Total	2.44	.887	135
	Humanities	0-5	1.73	1.100	15
		6-10	2.69	.928	26
		11-15	2.00	1.076	20
		15+	2.00	1.065	31
		Total	2.15	1.079	92
	Total	0-5	2.24	1.061	50
		6-10	2.55	.942	42
		11-15	2.28	.984	43
		15+	2.29	.944	92
		Total	2.33	.977	227

Levene's Test of Equality of Error Variances

Dependent Variable: SPECIFIC EXPERTISE

F	df1	df2	Sig.
1.821	15	211	.033

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

- a. Design: Intercept+Sex+Afield+Experien+Sex * Afield+Sex * Experien+Afield * Experien+Sex * Afield * Experien

Tests of Between-Subjects Effects

Dependent Variable: SPECIFIC EXPERTISE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	41.864 ^a	15	2.791	3.384	.000	.194
Intercept	934.122	1	934.122	1132.676	.000	.843
Sex	15.035	1	15.035	18.230	.000	.080
Afield	2.267	1	2.267	2.749	.099	.013
Experien	3.580	3	1.193	1.447	.230	.020
Sex * Afield	5.951	1	5.951	7.216	.008	.033
Sex * Experien	2.816	3	.939	1.138	.335	.016
Afield * Experien	7.417	3	2.472	2.998	.032	.041
Sex * Afield * Experien	2.255	3	.752	.911	.436	.013
Error	174.012	211	.825			
Total	1444.000	227				
Corrected Total	215.877	226				

- a. R Squared = .194 (Adjusted R Squared = .137)

Estimated Marginal Means

1. Grand Mean

Dependent Variable: SPECIFIC EXPERTISE

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
2.313	.069	2.177	2.448

2. Sex

Estimates

Dependent Variable: SPECIFIC EXPERTISE

Sex	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
male	2.606	.107	2.396	2.816
female	2.019	.087	1.848	2.190

Pairwise Comparisons

Dependent Variable: SPECIFIC EXPERTISE

(I) Sex	(J) Sex	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
male	female	.587*	.137	.000	.316	.858
female	male	-.587*	.137	.000	-.858	-.316

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: SPECIFIC EXPERTISE

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	15.035	1	15.035	18.230	.000	.080
Error	174.012	211	.825			

The F tests the effect of Sex. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. Academic field

Estimates

Dependent Variable: SPECIFIC EXPERTISE

Academic field	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
scientific	2.427	.091	2.246	2.607
Humanities	2.199	.103	1.996	2.401

Pairwise Comparisons

Dependent Variable: SPECIFIC EXPERTISE

(I) Academic field	(J) Academic field	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
scientific	Humanities	.228	.137	.099	-.043	.499
Humanities	scientific	-.228	.137	.099	-.499	.043

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: SPECIFIC EXPERTISE

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	2.267	1	2.267	2.749	.099	.013
Error	174.012	211	.825			

The F tests the effect of Academic field. This test is based on the linearly independent pair comparisons among the estimated marginal means.

4. Experience

Estimates

Dependent Variable: SPECIFIC EXPERTISE

Experience	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
0-5	2.111	.140	1.835	2.388
6-10	2.460	.151	2.161	2.758
11-15	2.449	.151	2.151	2.747
15+	2.230	.100	2.032	2.428

Pairwise Comparisons

Dependent Variable: SPECIFIC EXPERTISE

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
0-5	6-10	-.348	.206	.093	-.755	.059
	11-15	-.338	.206	.103	-.745	.069
	15+	-.119	.173	.493	-.459	.222
6-10	0-5	.348	.206	.093	-.059	.755
	11-15	.010	.214	.961	-.411	.432
	15+	.230	.182	.207	-.128	.588
11-15	0-5	.338	.206	.103	-.069	.745
	6-10	-.010	.214	.961	-.432	.411
	15+	.219	.181	.228	-.138	.577
15+	0-5	.119	.173	.493	-.222	.459
	6-10	-.230	.182	.207	-.588	.128
	11-15	-.219	.181	.228	-.577	.138

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: SPECIFIC EXPERTISE

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	3.580	3	1.193	1.447	.230	.020
Error	174.012	211	.825			

The F tests the effect of Experience. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

5. Sex * Academic field

Dependent Variable: SPECIFIC EXPERTISE

Sex	Academic field	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	scientific	2.535	.143	2.254	2.817
	Humanities	2.677	.158	2.365	2.989
female	scientific	2.318	.114	2.092	2.543
	Humanities	1.721	.131	1.463	1.978

6. Sex * Experience

Dependent Variable: SPECIFIC EXPERTISE

Sex	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	0-5	2.424	.204	2.022	2.826
	6-10	2.615	.239	2.144	3.086
	11-15	2.950	.249	2.460	3.440
	15+	2.435	.145	2.148	2.721
female	0-5	1.799	.193	1.418	2.179
	6-10	2.304	.186	1.938	2.671
	11-15	1.949	.172	1.610	2.288
	15+	2.026	.138	1.753	2.298

7. Academic field * Experience

Dependent Variable: SPECIFIC EXPERTISE

Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
scientific	0-5	2.464	.154	2.161	2.767
	6-10	2.227	.245	1.744	2.710
	11-15	2.565	.191	2.189	2.942
	15+	2.450	.117	2.220	2.680
Humanities	0-5	1.759	.235	1.296	2.222
	6-10	2.692	.178	2.341	3.043
	11-15	2.333	.234	1.871	2.796
	15+	2.010	.163	1.689	2.332

8. Sex * Academic field * Experience

Dependent Variable: SPECIFIC EXPERTISE

Sex	Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
male	scientific	0-5	2.706	.220	2.272	3.140
		6-10	2.000	.406	1.199	2.801
		11-15	2.900	.287	2.334	3.466
		15+	2.536	.172	2.197	2.874
	Humanities	0-5	2.143	.343	1.466	2.819
		6-10	3.231	.252	2.734	3.727
		11-15	3.000	.406	2.199	3.801
		15+	2.333	.234	1.871	2.796
female	scientific	0-5	2.222	.214	1.800	2.644
		6-10	2.455	.274	1.915	2.994
		11-15	2.231	.252	1.734	2.727
		15+	2.364	.158	2.052	2.675
	Humanities	0-5	1.375	.321	.742	2.008
		6-10	2.154	.252	1.657	2.650
		11-15	1.667	.234	1.204	2.129
		15+	1.687	.227	1.240	2.135

Post Hoc Tests

Experience

Multiple Comparisons

Dependent Variable: SPECIFIC EXPERTISE

Scheffe

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0-5	6-10	-.31	.190	.456	-.84	.23
	11-15	-.04	.189	.998	-.57	.49
	15+	-.05	.160	.990	-.50	.40
6-10	0-5	.31	.190	.456	-.23	.84
	11-15	.27	.197	.603	-.29	.82
	15+	.25	.169	.522	-.22	.73
11-15	0-5	.04	.189	.998	-.49	.57
	6-10	-.27	.197	.603	-.82	.29
	15+	-.01	.168	1.000	-.49	.46
15+	0-5	.05	.160	.990	-.40	.50
	6-10	-.25	.169	.522	-.73	.22
	11-15	.01	.168	1.000	-.46	.49

Based on observed means.

Homogeneous Subsets

SPECIFIC EXPERTISE

Scheffé^{a,b,c}

Experience	N	Subset
		1
0-5	50	2.24
11-15	43	2.28
15+	92	2.29
6-10	42	2.55
Sig.		.402

Means for groups in homogeneous subsets are displayed.

Based on Type III Sum of Squares

The error term is Mean Square(Error) = .825.

- a. Uses Harmonic Mean Sample Size = 51.325.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.
- c. Alpha = .05.

Profile Plots

Estimated Marginal Means of SPECIFIC EXPERTISE

Estimated Marginal Means of SPECIFIC EXPERTISE

Appendix I: 3-way Factorial ANOVA for Current Use

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Sex	1	male	100
	2	female	127
Academic field	1	scientific	135
	2	Humanities	92
Experience	0	0-5	50
	1	6-10	42
	2	11-15	43
	3	15+	92

Descriptive Statistics

Dependent Variable: CURRENT USE

Sex	Academic field	Experience	Mean	Std. Deviation	N
male	scientific	0-5	1.59	.712	17
		6-10	1.60	.894	5
		11-15	1.40	.516	10
		15+	1.50	.577	28
		Total	1.52	.624	60
	Humanities	0-5	1.29	.756	7
		6-10	1.69	.947	13
		11-15	2.80	1.095	5
		15+	1.60	.910	15
		Total	1.73	.987	40
	Total	0-5	1.50	.722	24
		6-10	1.67	.907	18
		11-15	1.87	.990	15
		15+	1.53	.702	43
		Total	1.60	.791	100
female	scientific	0-5	1.28	.669	18
		6-10	1.45	.688	11
		11-15	1.31	.480	13
		15+	1.58	.708	33
		Total	1.44	.663	75
	Humanities	0-5	.88	.354	8
		6-10	1.15	.555	13
		11-15	1.00	.378	15
		15+	1.00	.365	16
		Total	1.02	.420	52
	Total	0-5	1.15	.613	26
		6-10	1.29	.624	24
		11-15	1.14	.448	28
		15+	1.39	.671	49
		Total	1.27	.610	127
Total	scientific	0-5	1.43	.698	35
		6-10	1.50	.730	16
		11-15	1.35	.487	23
		15+	1.54	.647	61
		Total	1.47	.644	135
	Humanities	0-5	1.07	.594	15
		6-10	1.42	.809	26
		11-15	1.45	.999	20
		15+	1.29	.739	31
		Total	1.33	.800	92
	Total	0-5	1.32	.683	50
		6-10	1.45	.772	42
		11-15	1.40	.760	43
		15+	1.46	.686	92
		Total	1.41	.714	227

Levene's Test of Equality of Error Variances

Dependent Variable: CURRENT USE

F	df1	df2	Sig.
5.160	15	211	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

- a. Design: Intercept+Sex+Afield+Experien+Sex * Afield+Sex * Experien+Afield * Experien+Sex * Afield * Experien

Tests of Between-Subjects Effects

Dependent Variable: CURRENT USE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	22.024 ^a	15	1.468	3.329	.000	.191
Intercept	364.392	1	364.392	826.285	.000	.797
Sex	9.964	1	9.964	22.594	.000	.097
Afield	.060	1	.060	.137	.712	.001
Experien	2.738	3	.913	2.069	.105	.029
Sex * Afield	5.646	1	5.646	12.802	.000	.057
Sex * Experien	3.098	3	1.033	2.342	.074	.032
Afield * Experien	4.821	3	1.607	3.644	.014	.049
Sex * Afield * Experien	3.444	3	1.148	2.603	.053	.036
Error	93.051	211	.441			
Total	569.000	227				
Corrected Total	115.075	226				

- a. R Squared = .191 (Adjusted R Squared = .134)

Estimated Marginal Means

1. Grand Mean

Dependent Variable: CURRENT USE

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
1.444	.050	1.345	1.543

2. Sex

Estimates

Dependent Variable: CURRENT USE

Sex	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
male	1.683	.078	1.530	1.837
female	1.206	.063	1.080	1.331

Pairwise Comparisons

Dependent Variable: CURRENT USE

(I) Sex	(J) Sex	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
male	female	.478*	.100	.000	.280	.676
female	male	-.478*	.100	.000	-.676	-.280

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: CURRENT USE

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	9.964	1	9.964	22.594	.000	.097
Error	93.051	211	.441			

The F tests the effect of Sex. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. Academic field

Estimates

Dependent Variable: CURRENT USE

Academic field	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
scientific	1.463	.067	1.331	1.595
Humanities	1.426	.075	1.278	1.574

Pairwise Comparisons

Dependent Variable: CURRENT USE

(I) Academic field	(J) Academic field	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
scientific	Humanities	.037	.100	.712	-.161	.235
Humanities	scientific	-.037	.100	.712	-.235	.161

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: CURRENT USE

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	.060	1	.060	.137	.712	.001
Error	93.051	211	.441			

The F tests the effect of Academic field. This test is based on the linearly independent pair comparisons among the estimated marginal means.

4. Experience

Estimates

Dependent Variable: CURRENT USE

Experience	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
0-5	1.257	.103	1.054	1.459
6-10	1.475	.111	1.257	1.693
11-15	1.627	.111	1.409	1.845
15+	1.419	.073	1.274	1.564

Pairwise Comparisons

Dependent Variable: CURRENT USE

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
0-5	6-10	-.218	.151	.149	-.516	.079
	11-15	-.370*	.151	.015	-.668	-.073
	15+	-.162	.126	.200	-.411	.086
6-10	0-5	.218	.151	.149	-.079	.516
	11-15	-.152	.156	.333	-.460	.157
	15+	.056	.133	.672	-.206	.318
11-15	0-5	.370*	.151	.015	.073	.668
	6-10	.152	.156	.333	-.157	.460
	15+	.208	.133	.119	-.054	.470
15+	0-5	.162	.126	.200	-.086	.411
	6-10	-.056	.133	.672	-.318	.206
	11-15	-.208	.133	.119	-.470	.054

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: CURRENT USE

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	2.738	3	.913	2.069	.105	.029
Error	93.051	211	.441			

The F tests the effect of Experience. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

5. Sex * Academic field

Dependent Variable: CURRENT USE

Sex	Academic field	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	scientific	1.522	.104	1.316	1.728
	Humanities	1.845	.116	1.616	2.073
female	scientific	1.404	.084	1.239	1.569
	Humanities	1.007	.096	.819	1.196

6. Sex * Experience

Dependent Variable: CURRENT USE

Sex	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	0-5	1.437	.149	1.143	1.731
	6-10	1.646	.175	1.302	1.991
	11-15	2.100	.182	1.741	2.459
	15+	1.550	.106	1.341	1.759
female	0-5	1.076	.141	.798	1.355
	6-10	1.304	.136	1.036	1.572
	11-15	1.154	.126	.906	1.402
	15+	1.288	.101	1.088	1.487

7. Academic field * Experience

Dependent Variable: CURRENT USE

Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
scientific	0-5	1.433	.112	1.212	1.654
	6-10	1.527	.179	1.174	1.880
	11-15	1.354	.140	1.079	1.629
	15+	1.538	.085	1.370	1.706
Humanities	0-5	1.080	.172	.742	1.419
	6-10	1.423	.130	1.166	1.680
	11-15	1.900	.171	1.562	2.238
	15+	1.300	.119	1.065	1.535

8. Sex * Academic field * Experience

Dependent Variable: CURRENT USE

Sex	Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
male	scientific	0-5	1.588	.161	1.271	1.906
		6-10	1.600	.297	1.015	2.185
		11-15	1.400	.210	.986	1.814
		15+	1.500	.125	1.253	1.747
	Humanities	0-5	1.286	.251	.791	1.780
		6-10	1.692	.184	1.329	2.055
		11-15	2.800	.297	2.215	3.385
		15+	1.600	.171	1.262	1.938
female	scientific	0-5	1.278	.157	.969	1.586
		6-10	1.455	.200	1.060	1.849
		11-15	1.308	.184	.945	1.671
		15+	1.576	.116	1.348	1.804
	Humanities	0-5	.875	.235	.412	1.338
		6-10	1.154	.184	.791	1.517
		11-15	1.000	.171	.662	1.338
		15+	1.000	.166	.673	1.327

Post Hoc Tests

Experience

Multiple Comparisons

Dependent Variable: CURRENT USE

Scheffe

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0-5	6-10	-.13	.139	.824	-.52	.26
	11-15	-.08	.138	.960	-.46	.31
	15+	-.14	.117	.713	-.47	.19
6-10	0-5	.13	.139	.824	-.26	.52
	11-15	.06	.144	.984	-.35	.46
	15+	.00	.124	1.000	-.35	.34
11-15	0-5	.08	.138	.960	-.31	.46
	6-10	-.06	.144	.984	-.46	.35
	15+	-.06	.123	.969	-.41	.28
15+	0-5	.14	.117	.713	-.19	.47
	6-10	.00	.124	1.000	-.34	.35
	11-15	.06	.123	.969	-.28	.41

Based on observed means.

Homogeneous Subsets

CURRENT USE

Scheffé^{a,b,c}

Experience	N	Subset
		1
0-5	50	1.32
11-15	43	1.40
6-10	42	1.45
15+	92	1.46
Sig.		.781

Means for groups in homogeneous subsets are displayed.

Based on Type III Sum of Squares

The error term is Mean Square(Error) = .441.

- a. Uses Harmonic Mean Sample Size = 51.325.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.
- c. Alpha = .05.

Profile Plots

Estimated Marginal Means of CURRENT USE

Estimated Marginal Means of CURRENT USE

Appendix J: 3-way Factorial ANOVA for Motivations

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Sex	1	male	100
	2	female	127
Academic field	1	scientific	135
	2	Humanities	92
Experience	0	0-5	50
	1	6-10	42
	2	11-15	43
	3	15+	92

Descriptive Statistics

Dependent Variable: MOTIVATION

Sex	Academic field	Experience	Mean	Std. Deviation	N
male	scientific	0-5	2.47	.943	17
		6-10	2.80	.447	5
		11-15	2.70	.949	10
		15+	3.11	.685	28
		Total	2.83	.827	60
	Humanities	0-5	3.14	.690	7
		6-10	3.15	.801	13
		11-15	3.00	1.000	5
		15+	3.07	.799	15
		Total	3.10	.778	40
	Total	0-5	2.67	.917	24
		6-10	3.06	.725	18
		11-15	2.80	.941	15
		15+	3.09	.718	43
		Total	2.94	.814	100
female	scientific	0-5	3.06	.998	18
		6-10	3.27	.905	11
		11-15	2.85	.801	13
		15+	3.00	.791	33
		Total	3.03	.854	75
	Humanities	0-5	3.38	1.061	8
		6-10	3.23	.832	13
		11-15	2.93	1.280	15
		15+	2.81	1.276	16
		Total	3.04	1.137	52
	Total	0-5	3.15	1.008	26
		6-10	3.25	.847	24
		11-15	2.89	1.066	28
		15+	2.94	.966	49
		Total	3.03	.975	127
Total	scientific	0-5	2.77	1.003	35
		6-10	3.13	.806	16
		11-15	2.78	.850	23
		15+	3.05	.740	61
		Total	2.94	.844	135
	Humanities	0-5	3.27	.884	15
		6-10	3.19	.801	26
		11-15	2.95	1.191	20
		15+	2.94	1.063	31
		Total	3.07	.992	92
	Total	0-5	2.92	.986	50
		6-10	3.17	.794	42
		11-15	2.86	1.014	43
		15+	3.01	.858	92
		Total	2.99	.907	227

Levene's Test of Equality of Error Variances

Dependent Variable: MOTIVATION

F	df1	df2	Sig.
1.196	15	211	.276

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+Sex+Afield+Experien+Sex * Afield+Sex * Experien+Afield * Experien+Sex * Afield * Experien

Tests of Between-Subjects Effects

Dependent Variable: MOTIVATION

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10.314 ^a	15	.688	.826	.648	.055
Intercept	1569.724	1	1569.724	1885.433	.000	.899
Sex	.803	1	.803	.965	.327	.005
Afield	1.460	1	1.460	1.753	.187	.008
Experien	1.086	3	.362	.435	.728	.006
Sex * Afield	.838	1	.838	1.007	.317	.005
Sex * Experien	2.873	3	.958	1.150	.330	.016
Afield * Experien	2.660	3	.887	1.065	.365	.015
Sex * Afield * Experien	.133	3	.044	.053	.984	.001
Error	175.669	211	.833			
Total	2217.000	227				
Corrected Total	185.982	226				

a. R Squared = .055 (Adjusted R Squared = -.012)

Estimated Marginal Means

1. Grand Mean

Dependent Variable: MOTIVATION

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
2.998	.069	2.862	3.134

2. Sex

Estimates

Dependent Variable: MOTIVATION

Sex	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
male	2.930	.107	2.719	3.141
female	3.066	.087	2.894	3.238

Pairwise Comparisons

Dependent Variable: MOTIVATION

(I) Sex	(J) Sex	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
male	female	-.136	.138	.327	-.408	.137
female	male	.136	.138	.327	-.137	.408

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: MOTIVATION

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	.803	1	.803	.965	.327	.005
Error	175.669	211	.833			

The F tests the effect of Sex. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. Academic field

Estimates

Dependent Variable: MOTIVATION

Academic field	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
scientific	2.907	.092	2.726	3.088
Humanities	3.089	.103	2.886	3.293

Pairwise Comparisons

Dependent Variable: MOTIVATION

(I) Academic field	(J) Academic field	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
scientific	Humanities	-.183	.138	.187	-.455	.089
Humanities	scientific	.183	.138	.187	-.089	.455

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: MOTIVATION

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	1.460	1	1.460	1.753	.187	.008
Error	175.669	211	.833			

The F tests the effect of Academic field. This test is based on the linearly independent pair comparisons among the estimated marginal means.

4. Experience

Estimates

Dependent Variable: MOTIVATION

Experience	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
0-5	3.011	.141	2.733	3.289
6-10	3.114	.152	2.814	3.414
11-15	2.870	.152	2.570	3.169
15+	2.997	.101	2.798	3.195

Pairwise Comparisons

Dependent Variable: MOTIVATION

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
0-5	6-10	-.103	.207	.619	-.512	.306
	11-15	.141	.207	.497	-.268	.550
	15+	.014	.173	.934	-.327	.356
6-10	0-5	.103	.207	.619	-.306	.512
	11-15	.244	.215	.257	-.179	.668
	15+	.118	.182	.519	-.242	.477
11-15	0-5	-.141	.207	.497	-.550	.268
	6-10	-.244	.215	.257	-.668	.179
	15+	-.127	.182	.488	-.486	.233
15+	0-5	-.014	.173	.934	-.356	.327
	6-10	-.118	.182	.519	-.477	.242
	11-15	.127	.182	.488	-.233	.486

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: MOTIVATION

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	1.086	3	.362	.435	.728	.006
Error	175.669	211	.833			

The F tests the effect of Experience. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

5. Sex * Academic field

Dependent Variable: MOTIVATION

Sex	Academic field	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	scientific	2.769	.143	2.487	3.052
	Humanities	3.091	.159	2.777	3.404
female	scientific	3.044	.115	2.817	3.270
	Humanities	3.088	.131	2.829	3.347

6. Sex * Experience

Dependent Variable: MOTIVATION

Sex	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	0-5	2.807	.205	2.403	3.211
	6-10	2.977	.240	2.504	3.450
	11-15	2.850	.250	2.357	3.343
	15+	3.087	.146	2.799	3.375
female	0-5	3.215	.194	2.833	3.597
	6-10	3.252	.187	2.883	3.620
	11-15	2.890	.173	2.549	3.231
	15+	2.906	.139	2.632	3.180

7. Academic field * Experience

Dependent Variable: MOTIVATION

Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
scientific	0-5	2.763	.154	2.459	3.067
	6-10	3.036	.246	2.551	3.521
	11-15	2.773	.192	2.395	3.151
	15+	3.054	.117	2.822	3.285
Humanities	0-5	3.259	.236	2.793	3.724
	6-10	3.192	.179	2.840	3.545
	11-15	2.967	.236	2.502	3.431
	15+	2.940	.164	2.616	3.263

8. Sex * Academic field * Experience

Dependent Variable: MOTIVATION

Sex	Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
male	scientific	0-5	2.471	.221	2.034	2.907
		6-10	2.800	.408	1.996	3.604
		11-15	2.700	.289	2.131	3.269
		15+	3.107	.172	2.767	3.447
	Humanities	0-5	3.143	.345	2.463	3.823
		6-10	3.154	.253	2.655	3.653
		11-15	3.000	.408	2.196	3.804
		15+	3.067	.236	2.602	3.531
female	scientific	0-5	3.056	.215	2.632	3.480
		6-10	3.273	.275	2.730	3.815
		11-15	2.846	.253	2.347	3.345
		15+	3.000	.159	2.687	3.313
	Humanities	0-5	3.375	.323	2.739	4.011
		6-10	3.231	.253	2.732	3.730
		11-15	2.933	.236	2.469	3.398
		15+	2.812	.228	2.363	3.262

Post Hoc Tests

Experience

Multiple Comparisons

Dependent Variable: MOTIVATION

Scheffe

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0-5	6-10	-.25	.191	.645	-.78	.29
	11-15	.06	.190	.992	-.48	.59
	15+	-.09	.160	.956	-.54	.36
6-10	0-5	.25	.191	.645	-.29	.78
	11-15	.31	.198	.496	-.25	.86
	15+	.16	.170	.840	-.32	.63
11-15	0-5	-.06	.190	.992	-.59	.48
	6-10	-.31	.198	.496	-.86	.25
	15+	-.15	.169	.850	-.63	.32
15+	0-5	.09	.160	.956	-.36	.54
	6-10	-.16	.170	.840	-.63	.32
	11-15	.15	.169	.850	-.32	.63

Based on observed means.

Homogeneous Subsets

MOTIVATION

Scheffé^{a,b,c}

Experience	N	Subset
		1
11-15	43	2.86
0-5	50	2.92
15+	92	3.01
6-10	42	3.17
Sig.		.411

Means for groups in homogeneous subsets are displayed.

Based on Type III Sum of Squares

The error term is Mean Square(Error) = .833.

- a. Uses Harmonic Mean Sample Size = 51.325.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.
- c. Alpha = .05.

Appendix K: 3-way Factorial ANOVA for Barriers

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Sex	1	male	100
	2	female	127
Academic field	1	scientific	135
	2	Humanities	92
Experience	0	0-5	50
	1	6-10	42
	2	11-15	43
	3	15+	92

Descriptive Statistics

Dependent Variable: BARRIERS

Sex	Academic field	Experience	Mean	Std. Deviation	N
male	scientific	0-5	2.29	.849	17
		6-10	2.20	.447	5
		11-15	2.50	.972	10
		15+	2.54	.962	28
		Total	2.43	.890	60
	Humanities	0-5	2.71	.951	7
		6-10	2.62	.870	13
		11-15	3.00	1.000	5
		15+	2.60	.828	15
		Total	2.68	.859	40
	Total	0-5	2.42	.881	24
		6-10	2.50	.786	18
		11-15	2.67	.976	15
		15+	2.56	.908	43
		Total	2.53	.881	100
female	scientific	0-5	2.67	.907	18
		6-10	3.18	.405	11
		11-15	2.69	.751	13
		15+	2.70	.847	33
		Total	2.76	.803	75
	Humanities	0-5	2.50	1.195	8
		6-10	3.08	.277	13
		11-15	2.80	.775	15
		15+	3.19	.655	16
		Total	2.94	.752	52
	Total	0-5	2.62	.983	26
		6-10	3.13	.338	24
		11-15	2.75	.752	28
		15+	2.86	.816	49
		Total	2.83	.784	127
Total	scientific	0-5	2.49	.887	35
		6-10	2.88	.619	16
		11-15	2.61	.839	23
		15+	2.62	.897	61
		Total	2.61	.855	135
	Humanities	0-5	2.60	1.056	15
		6-10	2.85	.675	26
		11-15	2.85	.813	20
		15+	2.90	.790	31
		Total	2.83	.807	92
	Total	0-5	2.52	.931	50
		6-10	2.86	.647	42
		11-15	2.72	.826	43
		15+	2.72	.869	92
		Total	2.70	.840	227

Levene's Test of Equality of Error Variances

Dependent Variable: BARRIERS

F	df1	df2	Sig.
2.256	15	211	.006

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

- a. Design: Intercept+Sex+Afield+Experien+Sex * Afield+Sex * Experien+Afield * Experien+Sex * Afield * Experien

Tests of Between-Subjects Effects

Dependent Variable: BARRIERS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	14.595 ^a	15	.973	1.416	.142	.091
Intercept	1276.858	1	1276.858	1857.599	.000	.898
Sex	3.744	1	3.744	5.447	.021	.025
Afield	2.034	1	2.034	2.959	.087	.014
Experien	1.498	3	.499	.727	.537	.010
Sex * Afield	.786	1	.786	1.143	.286	.005
Sex * Experien	3.054	3	1.018	1.481	.221	.021
Afield * Experien	.257	3	.086	.125	.946	.002
Sex * Afield * Experien	2.626	3	.875	1.273	.284	.018
Error	145.035	211	.687			
Total	1815.000	227				
Corrected Total	159.630	226				

- a. R Squared = .091 (Adjusted R Squared = .027)

Estimated Marginal Means

1. Grand Mean

Dependent Variable: BARRIERS

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
2.704	.063	2.580	2.828

2. Sex

Estimates

Dependent Variable: BARRIERS

Sex	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
male	2.557	.097	2.366	2.749
female	2.850	.079	2.694	3.006

Pairwise Comparisons

Dependent Variable: BARRIERS

(I) Sex	(J) Sex	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
male	female	-.293*	.125	.021	-.540	-.046
female	male	.293*	.125	.021	.046	.540

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: BARRIERS

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	3.744	1	3.744	5.447	.021	.025
Error	145.035	211	.687			

The F tests the effect of Sex. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. Academic field

Estimates

Dependent Variable: BARRIERS

Academic field	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
scientific	2.596	.083	2.431	2.760
Humanities	2.812	.094	2.627	2.996

Pairwise Comparisons

Dependent Variable: BARRIERS

(I) Academic field	(J) Academic field	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
scientific	Humanities	-.216	.125	.087	-.463	.032
Humanities	scientific	.216	.125	.087	-.032	.463

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: BARRIERS

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	2.034	1	2.034	2.959	.087	.014
Error	145.035	211	.687			

The F tests the effect of Academic field. This test is based on the linearly independent pair comparisons among the estimated marginal means.

4. Experience

Estimates

Dependent Variable: BARRIERS

Experience	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
0-5	2.544	.128	2.291	2.796
6-10	2.769	.138	2.496	3.041
11-15	2.748	.138	2.476	3.020
15+	2.755	.092	2.575	2.936

Pairwise Comparisons

Dependent Variable: BARRIERS

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
0-5	6-10	-.225	.188	.234	-.596	.147
	11-15	-.204	.188	.279	-.576	.167
	15+	-.211	.158	.181	-.522	.099
6-10	0-5	.225	.188	.234	-.147	.596
	11-15	.020	.195	.917	-.365	.406
	15+	.013	.166	.935	-.313	.340
11-15	0-5	.204	.188	.279	-.167	.576
	6-10	-.020	.195	.917	-.406	.365
	15+	-.007	.166	.966	-.334	.320
15+	0-5	.211	.158	.181	-.099	.522
	6-10	-.013	.166	.935	-.340	.313
	11-15	.007	.166	.966	-.320	.334

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: BARRIERS

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	1.498	3	.499	.727	.537	.010
Error	145.035	211	.687			

The F tests the effect of Experience. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

5. Sex * Academic field

Dependent Variable: BARRIERS

Sex	Academic field	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	scientific	2.382	.130	2.126	2.639
	Humanities	2.732	.145	2.447	3.017
female	scientific	2.809	.104	2.604	3.015
	Humanities	2.891	.119	2.656	3.126

6. Sex * Experience

Dependent Variable: BARRIERS

Sex	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
male	0-5	2.504	.186	2.137	2.871
	6-10	2.408	.218	1.978	2.838
	11-15	2.750	.227	2.302	3.198
	15+	2.568	.133	2.306	2.829
female	0-5	2.583	.176	2.236	2.931
	6-10	3.129	.170	2.795	3.464
	11-15	2.746	.157	2.437	3.056
	15+	2.942	.126	2.693	3.191

7. Academic field * Experience

Dependent Variable: BARRIERS

Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
scientific	0-5	2.480	.140	2.204	2.757
	6-10	2.691	.224	2.250	3.132
	11-15	2.596	.174	2.252	2.940
	15+	2.616	.107	2.406	2.826
Humanities	0-5	2.607	.215	2.184	3.030
	6-10	2.846	.163	2.526	3.167
	11-15	2.900	.214	2.478	3.322
	15+	2.894	.149	2.600	3.187

8. Sex * Academic field * Experience

Dependent Variable: BARRIERS

Sex	Academic field	Experience	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
male	scientific	0-5	2.294	.201	1.898	2.691
		6-10	2.200	.371	1.469	2.931
		11-15	2.500	.262	1.983	3.017
		15+	2.536	.157	2.227	2.845
	Humanities	0-5	2.714	.313	2.097	3.332
		6-10	2.615	.230	2.162	3.069
		11-15	3.000	.371	2.269	3.731
		15+	2.600	.214	2.178	3.022
female	scientific	0-5	2.667	.195	2.281	3.052
		6-10	3.182	.250	2.689	3.675
		11-15	2.692	.230	2.239	3.146
		15+	2.697	.144	2.412	2.981
	Humanities	0-5	2.500	.293	1.922	3.078
		6-10	3.077	.230	2.624	3.530
		11-15	2.800	.214	2.378	3.222
		15+	3.187	.207	2.779	3.596

Post Hoc Tests

Experience

Multiple Comparisons

Dependent Variable: BARRIERS

Scheffe

(I) Experience	(J) Experience	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0-5	6-10	-.34	.174	.290	-.83	.15
	11-15	-.20	.172	.716	-.69	.29
	15+	-.20	.146	.608	-.61	.21
6-10	0-5	.34	.174	.290	-.15	.83
	11-15	.14	.180	.902	-.37	.64
	15+	.14	.154	.845	-.30	.57
11-15	0-5	.20	.172	.716	-.29	.69
	6-10	-.14	.180	.902	-.64	.37
	15+	.00	.153	1.000	-.43	.44
15+	0-5	.20	.146	.608	-.21	.61
	6-10	-.14	.154	.845	-.57	.30
	11-15	.00	.153	1.000	-.44	.43

Based on observed means.

Homogeneous Subsets

BARRIERS

Scheffé^{a,b,c}

Experience	N	Subset
		1
0-5	50	2.52
15+	92	2.72
11-15	43	2.72
6-10	42	2.86
Sig.		.240

Means for groups in homogeneous subsets are displayed.

Based on Type III Sum of Squares

The error term is Mean Square(Error) = .687.

- a. Uses Harmonic Mean Sample Size = 51.325.
- b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.
- c. Alpha = .05.

Appendix L: Factor Analysis for technology expertise**KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.902
Bartlett's Test of Sphericity	Approx. Chi-Square	1922.420
	df	66
	Sig.	.000

Communalities

	Initial	Extraction
1- Use a word processor to create documents.	1.000	.756
2- Use a spreadsheet to create charts and graphs.	1.000	.672
3- Use a computer to find resources from the university library.	1.000	.780
4- Searching the web to find information and resources.	1.000	.631
5- Use a database software to set up and access information.	1.000	.557
6- Use presentation software (e.g., PowerPoint).	1.000	.702
7- Use graphic software to create illustrations, slides, or images.	1.000	.642
8- Use audio/video clips software to create or enhance presentations.	1.000	.632
9- Website design.	1.000	.671
10- Use a computer to communicate with others.	1.000	.623
11- Use of electronic bulletin board.	1.000	.854
12- Use video conferencing	1.000	.806

Extraction Method: Principal Component Analysis.

Total Variance Explained

C o m p-	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.756	56.301	56.301	6.756	56.301	56.301	4.866	40.549	40.549
2	1.570	13.082	69.383	1.570	13.082	69.383	3.460	28.834	69.383
3	.697	5.808	75.190						
4	.559	4.661	79.851						
5	.428	3.569	83.421						
6	.402	3.351	86.772						
7	.389	3.240	90.012						
8	.362	3.018	93.030						
9	.282	2.352	95.382						
10	.234	1.951	97.334						
11	.176	1.468	98.802						
12	.144	1.198	100.000						

Extraction Method: Principal Component Analysis.

Scree Plot

Component Matrix^a

	Component	
	1	2
1- Use a word processor to create documents.	.766	-.412
2- Use a spreadsheet to create charts and graphs.	.797	-.191
3- Use a computer to find resources from the university library.	.750	-.467
4- Searching the web to find information and resources.	.772	-.188
5- Use a database software to set up and access information.	.745	-.041
6- Use presentation software (e.g., PowerPoint).	.766	-.340
7- Use graphic software to create illustrations, slides, or images.	.801	-.025
8- Use audio/video clips software to create or enhance presentations.	.779	.159
9- Website design.	.690	.441
10- Use a computer to communicate with others.	.789	.025
11- Use of electronic bulletin board.	.690	.614
12- Use video conferencing	.642	.628

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Rotated Component Matrix^a

	Component	
	1	2
1- Use a word processor to create documents.	.859	
2- Use a spreadsheet to create charts and graphs.	.751	
3- Use a computer to find resources from the university library.	.880	
4- Searching the web to find information and resources.	.729	
5- Use a database software to set up and access information.	.619	.417
6- Use presentation software (e.g., PowerPoint).	.816	
7- Use graphic software to create illustrations, slides, or images.	.654	.463
8- Use audio/video clips software to create or enhance presentations.	.525	.597
9- Website design.		.768
10- Use a computer to communicate with others.	.614	.496
11- Use of electronic bulletin board.		.906
12- Use video conferencing		.888

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	.797	.604
2	-.604	.797

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Component Plot in Rotated Space **Appendix M: Factor Analysis for current usage of e-learning****KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.887
Bartlett's Test of Sphericity	Approx. Chi-Square	1921.710
	df	105
	Sig.	.000

Communalities

	Initial	Extraction
1- Use of computer software for handouts or lecture notes.	1.000	.687
2- Use Email as the primary source of student contact outside the classroom.	1.000	.627
3- Hold virtual office hours.	1.000	.334
4- Use of presentation software in the classroom.	1.000	.706
5- Use On-line bulletin board.	1.000	.633
6- Use personally designed Web-based lectures, notes, or tutorials.	1.000	.794
7- Use personally designed Web-based tests or quizzes.	1.000	.739
8- Provided web-based grades.	1.000	.613
9- Used Internet research and searches.	1.000	.474
10- Posting required readings on course web page.	1.000	.592
11- Use On-line Chat room	1.000	.557
12- Commenting on course work electronically.	1.000	.657
13- Electronics conferencing.	1.000	.792
14- Use video tapes for instruction.	1.000	.789
15- Use audio tapes for instruction.	1.000	.756

Extraction Method: Principal Component Analysis.

Total Variance Explained

Com p.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.722	44.815	44.815	6.722	44.815	44.815	4.885	32.570	32.570
2	1.942	12.944	57.759	1.942	12.944	57.759	3.185	21.231	53.800
3	1.088	7.256	65.015	1.088	7.256	65.015	1.682	11.215	65.015
4	.826	5.509	70.524						
5	.802	5.346	75.870						
6	.619	4.123	79.994						
7	.548	3.654	83.647						
8	.473	3.155	86.803						
9	.398	2.655	89.457						
10	.366	2.439	91.896						
11	.335	2.235	94.131						
12	.299	1.994	96.125						
13	.233	1.554	97.679						
14	.181	1.205	98.884						
15	.167	1.116	100.000						

Extraction Method: Principal Component Analysis.

Scree Plot

Component Matrix^a

	Component		
	1	2	3
1- Use of computer software for handouts or lecture notes.	.489	.669	.034
2- Use Email as the primary source of student contact outside the classroom.	.688	.350	-.176
3- Hold virtual office hours.	.577	.028	-.025
4- Use of presentation software in the classroom.	.653	.525	.071
5- Use On-line bulletin board.	.775	-.149	.103
6- Use personally designed Web-based lectures, notes, or tutorials.	.802	-.382	-.070
7- Use personally designed Web-based tests or quizzes.	.729	-.441	-.113
8- Provided web-based grades.	.558	.197	-.512
9- Used Internet research and searches.	.322	.592	.141
10- Posting required readings on course web page.	.673	.281	-.244
11- Use On-line Chat room	.689	-.269	-.105
12- Commenting on course work electronically.	.771	-.197	-.153
13- Electronics conferencing.	.811	-.365	-.031
14- Use video tapes for instruction.	.696	.061	.549
15- Use audio tapes for instruction.	.629	-.130	.586

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Rotated Component Matrix^a

	Component		
	1	2	3
1- Use of computer software for handouts or lecture notes.		.815	
2- Use Email as the primary source of student contact outside the classroom.	.419	.671	
3- Hold virtual office hours.	.452		
4- Use of presentation software in the classroom.		.772	
5- Use On-line bulletin board.	.662		
6- Use personally designed Web-based lectures, notes, or tutorials.	.859		
7- Use personally designed Web-based tests or quizzes.	.845	.011	
8- Provided web-based grades.	.499	.514	
9- Used Internet research and searches.	-.096	.652	
10- Posting required readings on course web page.	.464	.613	
11- Use On-line Chat room	.720		
12- Commenting on course work electronically.	.763		
13- Electronics conferencing.	.845		
14- Use video tapes for instruction.			.740
15- Use audio tapes for instruction.			.765

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.795	.512	.324
2	-.522	.851	-.065
3	-.309	-.117	.944

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Component Plot in Rotated Space

Appendix N: Factor Analysis for motivational factors

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.951
Bartlett's Test of Sphericity	Approx. Chi-Square	4752.417
	df	253
	Sig.	.000

Communalities

	Initial	Extraction
1- Requirement by department or university	1.000	.683
2- Administrative encouragement and support	1.000	.735
3- Technical support in solving computer problems	1.000	.838
4- Support and encouragement from peers	1.000	.699
5- Access to software tools for enhancing teaching with technology	1.000	.761
6- Credit toward promotion and tenure	1.000	.807
7- Professional prestige and status	1.000	.760
8- Training programs and support	1.000	.769
9- Reduced teaching load.	1.000	.621
10- Opportunity to improve teaching	1.000	.594
11- Rewards/recognition for innovation in teaching	1.000	.776
12- Time available to learn/pursue the integration of e-learning technologies	1.000	.788
13-Increase in salary.	1.000	.778
14- Opportunity to reach new audience that can not attend classes on campus.	1.000	.665
15- Opportunity for scholarly pursuit	1.000	.707
16- Funding for materials/expenses	1.000	.744
17- Classroom technology infrastructure (e.g., wiring , computers, or projectors)	1.000	.821
18- Resources about how to apply technology in teaching.	1.000	.549
19- Student' access to resources	1.000	.825
20- Student' computer skills	1.000	.773
21- My computer skills	1.000	.776
22- My colleagues' computer skills	1.000	.759
23- Opportunity to enhance communication with others.	1.000	.744

Extraction Method: Principal Component Analysis.

Total Variance Explained

C o m p.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulati ve %	Total	% of Variance	Cumulati ve %	Total	% of Variance	Cumulati ve %
1	13.6	58.973	58.973	13.6	58.973	58.973	6.419	27.910	27.910
2	1.212	5.270	64.244	1.212	5.270	64.244	3.874	16.842	44.752
3	1.191	5.177	69.420	1.191	5.177	69.420	3.596	15.635	60.387
4	1.006	4.374	73.794	1.006	4.374	73.794	3.084	13.408	73.794
5	.778	3.385	77.179						
6	.616	2.680	79.859						
7	.557	2.424	82.282						
8	.472	2.052	84.334						
9	.467	2.033	86.366						
10	.377	1.637	88.003						
11	.353	1.533	89.537						
12	.300	1.305	90.841						
13	.282	1.228	92.070						
14	.268	1.165	93.235						
15	.257	1.119	94.353						
16	.216	.939	95.292						
17	.195	.848	96.140						
18	.192	.835	96.976						
19	.170	.739	97.715						
20	.167	.727	98.442						
21	.148	.644	99.086						
22	.128	.555	99.641						
23	.083	.359	100.000						

Extraction Method: Principal Component Analysis.

Scree Plot

Component Matrix^a

	Component			
	1	2	3	4
1- Requirement by department or university	.595	.385	.321	.280
2- Administrative encouragement and support	.704	.467	.140	.045
3- Technical support in solving computer problems	.753	.385	.056	-.347
4- Support and encouragement from peers	.709	.338	.282	.052
5- Access to software tools for enhancing teaching with technology	.798	.296	.003	-.189
6- Credit toward promotion and tenure	.747	-.164	.467	.059
7- Professional prestige and status	.628	-.341	.500	-.002
8- Training programs and support	.823	-.060	.065	-.289
9- Reduced teaching load.	.727	-.252	.031	-.166
10- Opportunity to improve teaching	.762	.057	-.060	-.080
11- Rewards/recognition for innovation in teaching	.830	-.224	.191	.020
12- Time available to learn/pursue the integration of e-learning technologies	.873	-.070	-.030	-.144
13-Increase in salary.	.781	-.371	.137	.111
14- Opportunity to reach new audience that can not attend classes on campus.	.778	-.239	-.054	-.012
15- Opportunity for scholarly pursuit	.822	-.078	-.121	-.103
16- Funding for materials/expenses	.853	-.045	-.078	-.095
17- Classroom technology infrastructure (e.g., wiring , computers, or projectors)	.864	.099	-.197	-.162
18- Resources about how to apply technology in teaching.	.649	-.095	-.320	-.130
19- Student' access to resources	.861	-.002	-.287	-.035
20- Student' computer skills	.789	-.052	-.344	.173
21- My computer skills	.812	-.008	-.224	.258
22- My colleagues' computer skills	.673	.029	-.073	.547
23- Opportunity to enhance communication with others.	.748	.043	-.175	.391

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Rotated Component Matrix^a

	Component			
	1	2	3	4
1- Requirement by department or university			.694	
2- Administrative encouragement and support			.739	
3- Technical support in solving computer problems	.604		.669	
4- Support and encouragement from peers			.696	
5- Access to software tools for enhancing teaching with technology	.589		.594	
6- Credit toward promotion and tenure		.753		
7- Professional prestige and status	.173	.823		
8- Training programs and support	.658	.459		
9- Reduced teaching load.	.569	.506		
10- Opportunity to improve teaching	.566			
11- Rewards/recognition for innovation in teaching	.450	.644		
12- Time available to learn/pursue the integration of e-learning technologies	.668	.427		
13-Increase in salary.	.414	.673		
14- Opportunity to reach new audience that can not attend classes on campus.	.567	.467		
15- Opportunity for scholarly pursuit	.664			
16- Funding for materials/expenses	.653			
17- Classroom technology infrastructure (e.g., wiring , computers, or projectors)	.746			
18- Resources about how to apply technology in teaching.	.674			
19- Student' access to resources	.737			.411
20- Student' computer skills	.617			.580
21- My computer skills	.519			.622
22- My colleagues' computer skills				.763
23- Opportunity to enhance communication with others.				.692

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 12 iterations.

Component Transformation Matrix

Component	1	2	3	4
1	.653	.465	.440	.405
2	-.097	-.591	.800	-.034
3	-.544	.659	.407	-.323
4	-.518	.005	-.022	.855

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Component Plot in Rotated Space

Appendix O: Factor Analysis for barriers

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.887
Bartlett's Test of Sphericity	Approx. Chi-Square	2162.845
	df	153
	Sig.	.000

Communalities

	Initial	Extraction
1- Lack of interest.	1.000	.684
2- Lack of time to learn new technology	1.000	.564
3- Negative comments made by colleagues about e-learning technologies.	1.000	.698
4- Lack of support and encouragement from administrative.	1.000	.473
5- Lack of support and encouragement from peers.	1.000	.673
6- Lack of instructors' technological knowledge.	1.000	.513
7- Lack of students' technological knowledge.	1.000	.563
8- Lack of training programs.	1.000	.764
9- Lack of face-to-face interaction in e-learning courses.	1.000	.632
10- Lack of credit toward promotion and tenure.	1.000	.696
11- Lack of funding for materials/expenses.	1.000	.631
12- Lack of rewards/recognition for innovation in teaching	1.000	.596
13- Concern about course quality.	1.000	.583
14- Lack of technical support in solving computer problems.	1.000	.660
15- Lack of technological infrastructure.	1.000	.822
16- Lack of Student' access to resources.	1.000	.825
17- Lack of resources about how to apply technology in teaching.	1.000	.755
18- Security concerns.	1.000	.464

Extraction Method: Principal Component Analysis.

Total Variance Explained

Com p.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.110	39.501	39.501	7.110	39.501	39.501	4.090	22.720	22.720
2	2.037	11.316	50.817	2.037	11.316	50.817	2.804	15.577	38.296
3	1.420	7.887	58.704	1.420	7.887	58.704	2.394	13.302	51.598
4	1.029	5.718	64.422	1.029	5.718	64.422	2.308	12.823	64.422
5	.907	5.039	69.460						
6	.839	4.660	74.120						
7	.704	3.909	78.030						
8	.612	3.399	81.429						
9	.533	2.961	84.390						
10	.482	2.675	87.065						
11	.442	2.454	89.520						
12	.401	2.230	91.749						
13	.333	1.852	93.601						
14	.306	1.702	95.303						
15	.270	1.497	96.800						
16	.249	1.385	98.185						
17	.216	1.199	99.384						
18	.111	.616	100.000						

Extraction Method: Principal Component Analysis.

Scree Plot

Component Matrix^a

	Component			
	1	2	3	4
1- Lack of interest.	.494	.089	.642	-.138
2- Lack of time to learn new technology	.612	-.028	.362	-.240
3- Negative comments made by colleagues about e-learning technologies.	.412	.643	.312	-.130
4- Lack of support and encouragement from administrative.	.601	.148	.076	-.290
5- Lack of support and encouragement from peers.	.498	.638	.114	-.069
6- Lack of instructors' technological knowledge.	.679	.115	-.060	-.188
7- Lack of students' technological knowledge.	.645	.190	-.224	-.247
8- Lack of training programs.	.744	-.169	-.308	-.295
9- Lack of face-to-face interaction in e-learning courses.	.584	-.015	-.490	-.224
10- Lack of credit toward promotion and tenure.	.447	.484	-.349	.374
11- Lack of funding for materials/expenses.	.761	-.087	-.173	.119
12- Lack of rewards/recognition for innovation in teaching	.551	.369	-.268	.290
13- Concern about course quality.	.486	-.038	.341	.479
14- Lack of technical support in solving computer problems.	.722	-.365	-.023	.072
15- Lack of technological infrastructure.	.769	-.443	.143	.120
16- Lack of Student' access to resources.	.792	-.436	.060	.069
17- Lack of resources about how to apply technology in teaching.	.775	-.373	.032	.118
18- Security concerns.	.532	.262	.066	.328

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Rotated Component Matrix^a

	Component			
	1	2	3	4
1- Lack of interest.			.735	
2- Lack of time to learn new technology	.426		.568	
3- Negative comments made by colleagues about e-learning technologies.			.734	
4- Lack of support and encouragement from administrative.		.439	.467	
5- Lack of support and encouragement from peers.			.605	.499
6- Lack of instructors' technological knowledge.		.501		
7- Lack of students' technological knowledge.		.618		
8- Lack of training programs.	.427	.750		
9- Lack of face-to-face interaction in e-learning courses.		.736		
10- Lack of credit toward promotion and tenure.				.804
11- Lack of funding for materials/expenses.	.555	.428		
12- Lack of rewards/recognition for innovation in teaching				.696
13- Concern about course quality.	.582			
14- Lack of technical support in solving computer problems.	.725			
15- Lack of technological infrastructure.	.860			
16- Lack of Student' access to resources.	.835			
17- Lack of resources about how to apply technology in teaching.	.793			
18- Security concerns.				.548

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Component Transformation Matrix

Component	1	2	3	4
1	.658	.518	.395	.378
2	-.635	-.001	.476	.609
3	.235	-.609	.695	-.300
4	.330	-.601	-.366	.629

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Component Plot in Rotated Space

Appendix P: Curriculum Vitae

Salem A. Albalwi

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304-216
e-mail: salbalwi@mix.wvu.edu

EDUCATION:

West Virginia University

Morgantown, West Virginia, USA

Doctor of Education (Ed.D) - Curriculum and Instruction
December, 2008

Dissertation: *Intrinsic and Extrinsic Factors that influence
instructors' Use of E-learning*

Coursework in Foundations and Theory

C&I789	Teaching in Higher Education
C&I604	Secondary School Curriculum
C&I701	Curriculum Development
C&I707	Theories, Models, and Research of Teaching
C&I791	Curriculum Evaluation
C&I591	Issues in Curriculum
C&I689	Cultural Diversity - Classroom
C&I593A	SPTP: Advanced Curriculum Specialization
C&I693S	SPTT: Creativity & Learning
EDP600	Educational Psychology

Coursework in Teaching Strategies

C&I687	Advanced Teaching Strategies
C&I688	Classroom Organization & Management
C&I631	Mathematics- Elementary School
C&I480B	Special Problem
C&I790	Teaching Practicum
EDP 610	Measurement/Assessment for the Classroom Teacher
C&I693A	Performance Assessment
C&I594	Sem: Clinical Expr Capston

Coursework in Research

EDP612	Introduction to Research
BIBY615	Methods of Research
EDP613	Statistical Methods 1
EDP614	Statistical Methods 2
SCFD615	Qualitative Research Methods

West Virginia University

Morgantown, West Virginia, USA

Master of Arts - Secondary Education
May, 2006

King Abdulaziz University
(Teachers College)

Jeddah, Kingdom of Saudi Arabia

Bachelor of Computer Science
February, 2003

Experience

1990-1996: Jeddah Education Department, Mathematics Teacher.

1996-2000: Al Ola Education Department, Mathematics and Computer
Science Teacher.

2004-2005: Director of Computer and Information Center, Madina
Teachers College.

Conferences:

(SITE) conference, Society for Information Technology & Teacher
Education, Orlando, Florida, USA, 2006

(MAA) conference, Mathematical Association of America, Pensacola,
Florida, USA, 2008

Membership:

◌(AERA) American Educational Research Association, USA

(AACE) Association for the Advancement of Computing in Education, USA

Interests:

- E-learning
- Computerized Testing
- Programming and Data Bases
- Statistical Software (SPSS, STATA, SAS)
- Educational Research