

E-Learning in Teacher Education

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Abstract

Use of technology to facilitate learning is accepted to be of value across educational institutions. Government of India has taken cognizance of the institutional support required for resources in e-learning and formulated the national mission on education through ICT. However, the focus is still largely on getting the infrastructure and creating the e-learning content. It is necessary to consider the individual factors that play an important role in the adoption of e-learning. For example, attitude of students and teachers towards e-learning may affect their acceptance of the technology in the teaching-learning process. While there have been studies to understand the factors of the instructors (e.g. release time for staff to engage in e-learning) and students (e.g. learning style) in acceptance of e-learning separately, a comprehensive view that considers both students and teachers in the same model is lacking. To address this research gap, this paper considers the attitudes of students and the teachers that determine intention and actual use of the e-learning technology simultaneously in the model of e-learning.

ELAM (e-learning acceptance model) identifies the key factors in acceptance of e-learning as measured by behavioural intention to use the technology and actual usage. The four determinants of e-learning acceptance are --- (i) performance expectancy, (ii) effort expectancy, (iii) social influence and (iv) facilitating conditions. Performance expectancy is based on beliefs about perceived usefulness, interactivity and flexibility.. The main contribution of the paper is that it presents a framework to understand e-learning acceptance as governed by the teacher, student and institutional factors.

Keywords – e-learning acceptance, performance expectancy, social influence, facilitating conditions, learning style, teaching style.

1. Introduction

ICT revolution has given rise to 'learning economy' wherein the capability to learn how to create new knowledge and adapt to changing conditions determines the performance of individuals, institutions, regions, and countries (Lundvall & Borrás 1999). This has fuelled the demand for e-learning both at organisational and educational sector. *E-learning is defined as learning facilitated and supported through the utilization of information and communication technologies (Jenkins and Hanson 2003)*. Thus, e-learning includes use of ICTs (viz. Internet, computer, mobile phone and video) to support teaching and learning activities.

Use of technology to facilitate learning is accepted to be of value across educational institutions. E-learning holds particular relevance to India as the youth constitute its major population and there is no other way to take education to such a scale without the intervention of technology. Government of India has taken cognizance of the institutional support required for resources in e-learning and formulated the national mission on education through ICT. A proper view of technology use in the teaching process across different levels

indicates that the range varies from the use of presentation software such as Powerpoint in the classroom to using a Learning Management System such as Moodle for course management. It is assumed that as some technology is used, positive results will follow. The focus is largely on getting the infrastructure and creating the e-learning content. Thus, a top-down approach is followed, rather than considering the requirements and attitudes of students and teachers.

It is recognized that unless the individual factors of teachers and students are considered, potential of e-learning will not be fully utilised, thus lowering the return on investment (Yuen & Ma 2008). Developing countries like India which are in the infancy

stage of e-learning adoption cannot afford to fail in the e-learning implementation. Hence, it is essential to take cognizance of the user (teachers and students) as the major factor in any technology-enhanced learning environment. Thus, it is important to consider both factors relating to the key players --- students, teachers and institution --- in the implementation of e-learning.

To the best of our knowledge, there are no technology acceptance studies of e-learning that includes factors related to students and teachers in the same model. In light of this, the paper proposes a model, which we call ELAM, to explain acceptance of e-learning as governed by attitudes of students, teachers and institutional support. This includes assessment of the e-learning tool (performance expectancy and effort expectancy) and the context (social influence and facilitating conditions). The predominant teaching style of teachers and learning style of students are considered as mediators affecting the relation between determinants of e-learning acceptance and intention to use the technology.

Definitions of the different determinants --- performance expectancy, effort expectancy, social influence, facilitating conditions, behavioural intention, actual usage --- and mediators ----teaching style, learning style --- is presented.

1. Literature Review: Models of Technology Acceptance

The Technology Acceptance Model (TAM), introduced by Davis (1989), is an adaptation of social psychology theory of reasoned action, specifically tailored for modelling user acceptance of information systems. The former refers to the extent to which a person believes that using the system will enhance task performance, while the latter refers to the degree to which the user expects the target system to be free of effort. Across studies, perceived usefulness is highlighted as the most significant determinant of behavioral intention to the technology (Horst et. al. 2007; Venkatesh et. al. 2003). The TAM explains user behaviour across a broad range of end-user computing technologies (e.g., text editor, spreadsheet, e-mail) and user population (e.g., students, software professionals, physicians). The predictive power of TAM varies according to the cultural context. Its power of prediction is higher in the West (45–70%) than the East (10–35%). Perceived usefulness emerges as important across all the cultures studied, whereas subjective norm is more important for the East than the West (Rose & Straub 1998; Straub 1994). Subjective norm has been of particular interest in Asian and African research, and cultural factors are highlighted to explain its relevance in determining behavioral intention to use computers (Dinev et. al. 2004; Mao & Palvia 2001).

Venkatesh and Davis (2000) extended the original TAM model and proposed TAM2. They explain perceived usefulness and usage intentions in terms of social influence process and cognitive instrumental processes. The social influence process highlights the impact of three inter-related social forces impinging on an individual facing the opportunity to adopt or reject a new system --- subjective norm, voluntariness and image. The cognitive instrumental process highlights the individual's job relevance and output quality. Results demonstrability and perceived ease of use are other fundamental determiners of user acceptance.

Venkatesh et. al. (2003) formulated the Unified Theory of Acceptance and Use of Technology (UTAUT), as shown in Figure 2. UTUAT is based upon the conceptual and empirical similarities across different technology acceptance models. The theory states that user acceptance and usage of technology is explained by four factors --- performance expectancy, effort expectancy, social influence and facilitating conditions.

i. *Performance expectancy* is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance.

ii. *Effort expectancy* is defined as the degree of ease associated with the use of the system.

iii. *Social influence* is defined as the degree to which an individual perceives that important others believe he or she should use the new system.

iv. *Facilitating conditions* are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.

v. *Behavioral intention* refers to the individual's decision regarding future system use.

vi. *Use behaviour* refers to the actual usage of the system.

Performance expectancy is the strongest predictor of intention and remains significant in both voluntary and mandatory settings, at all points of measurement. Effort expectancy is significant in both voluntary and mandatory usage contexts; but only during the initial stages of adoption. Social influence is significant in voluntary but not in mandatory context. Further, facilitating conditions have a direct influence on usage beyond that explained by behavioral intentions alone.

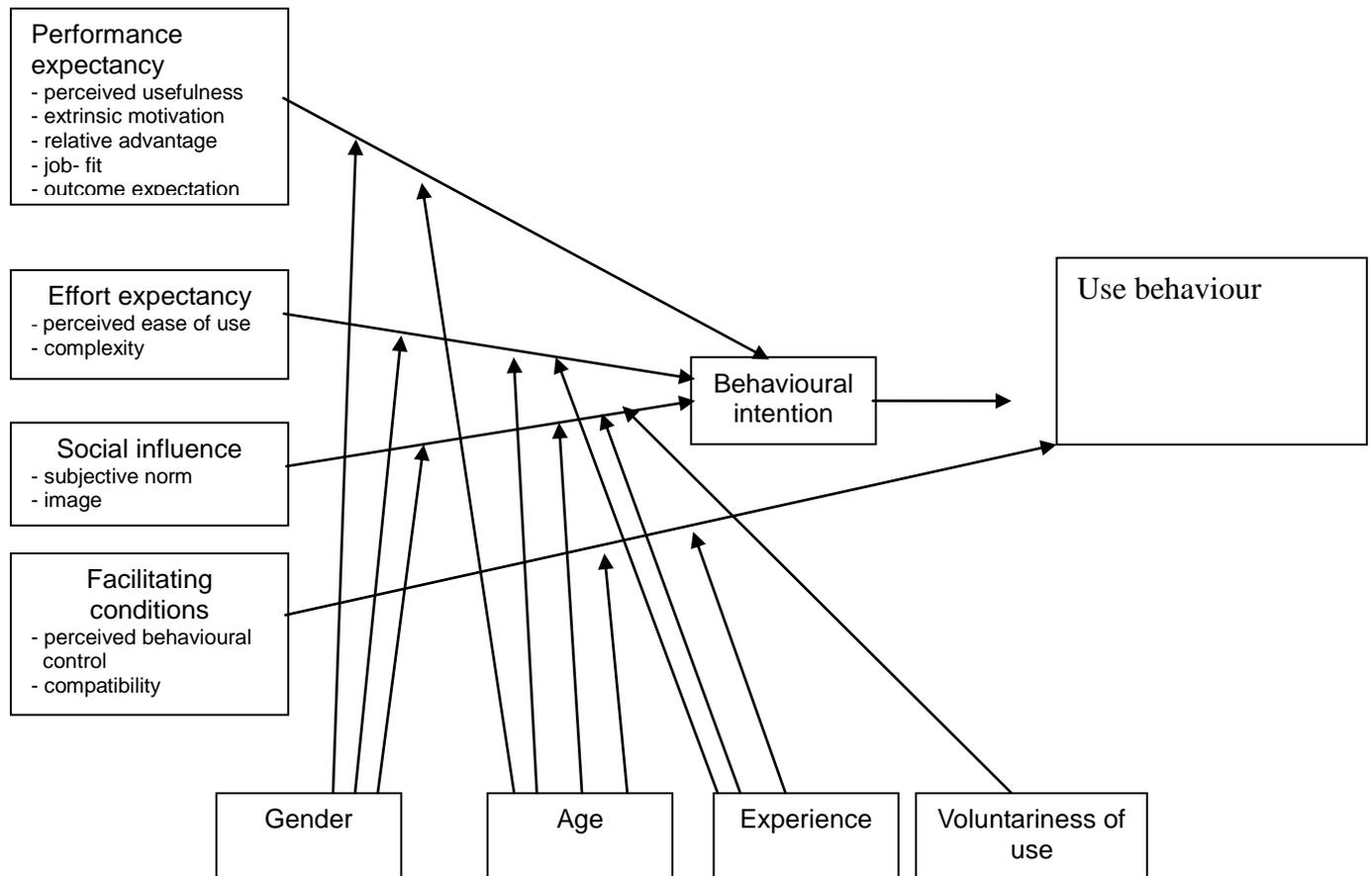


Figure 2: Model of United Theory of Technology Acceptance

Source: Venkatesh, et. al. (2003) User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27 (3), 425-478.

3. E-Learning Acceptance Model [ELAM]

E-learning is defined as learning facilitated and supported through the utilization of information and communication technologies (Jenkins & Hanson 2003). Thus, e-learning includes the use of ICT tools (e.g. Internet, computer) and content created with technology (e.g. animations, videos) to support teaching and learning activities.

Acceptance of e-learning involves acceptance of technology, but differs in some key respects as the pedagogical aspects need to be considered. Studies of e-learning technology acceptance have been considered, and tested it on either teachers (Nanayakkara 2007; Yuen & Ma 2008) or students (Keller, et. al. 2008; Masrom 2007). These studies provide evidence for centrality of attitudes in acceptance of e-learning. It is found that perceived ease of use or effort expectancy is the most important factor for teachers, while perceived usefulness or performance expectancy is the most important factor for students (Jung, et. al. 2008; Raaij & Schepers 2008).

There is no research that consolidates the attitudes of both students and teachers in the framework of e-learning acceptance. The key determinants are the same --- performance expectancy, effort expectancy, social influence and facilitating conditions. As acceptance of e-learning in teaching-learning process is likely to be under volitional control, it is assumed that a person's intention to use the technology is the immediate determinant of the action. The behavioural intention coupled with facilitating conditions determines actual usage of technology. As e-learning is associated with individualization of the teaching-learning process, the learning style of the student and teaching style of the teacher is an important factor affecting the adoption process. These factors are considered as mediators affecting the relation between performance expectancy beliefs and behavioural intention to use e-learning.

3.1 Key differentiators of ELAM

The key differentiators of the E-learning Acceptance Model (*ELAM*) are:

- The attitudes of both students and teachers to explain acceptance of e-learning. Items assessing each factor are adapted for both the groups. The variables are comparable, as similar information is elicited from teachers and students.
- It is postulated that the preferred learning style of the student and teaching style of the teacher affects the relation between performance expectancy and behavioural intention to use e-learning.
- Studies of e-learning acceptance are conducted in the West and developed countries of the East. We provide a view that is applicable in the context of developing countries. Hence, the real world constraints of developing countries, such as limited access to technology are accounted for in the facilitating condition variable of ELAM.
- Most of the e-learning acceptance studies, estimate acceptance of technology by a measure of behavioural intention and do not consider actual usage of the technology. Even when actual usage is included, only usage of particular e-learning tools such as WWW, e-mail and presentation software or a particular learning management system such as blackboard is considered (Marchewka et. al. 2007; Abdallah 2007). In ELAM, we include both behavioural intention and actual usage as indicating acceptance of e-learning.

3.2 Description of ELAM

Table 1 (refer appendix) lists the different constructs and instruments to assess each of the factors in the proposed e-learning acceptance model (ELAM). The following paragraph presents a brief description of each of the factors.

Performance expectancy (PE): is defined as the degree to which the student and teacher believes that using the system will result in gains in the teaching-learning process. This includes three factors:

- i. Perceived usefulness - refers to the extent to which students and teachers believe that using e-learning will enhance their performance. The facets tapped are --- improved understanding, higher achievement, efficiency and decreased study/teaching load.
- ii. Interactivity - refers to the extent to which e-learning facilitates interaction between students and teachers and amongst group of students. The facets measured are --- asking questions to students and teachers, working in collaboration and using online resources.
- iii. Flexibility - refers to the extent to which e-learning tools and content accommodate the preference of students and teachers. The facets assessed are --- choosing topics in the order of interest, self-paced learning or teaching, convenience (any time-any place) and adaptability to preferred learning style of students or teaching style of teachers.

Effort expectancy (EE): is defined as the extent to which the student and teacher believes that the e-learning tool requires effort. It includes three factors:

- i. Perceived ease of use - refers to the degree to which the user expects the target system to be free of effort. The facets tapped --- effort required, understanding of how the system works.

ii. Ease of learning to use the system - refers to the extent to which the user finds the e-learning tool easy to learn.

iii. Perceived efficacy - refers to the evaluation of competence to use e-learning. Also included within this dimension is evaluation of competence of the other player, that is, students are asked to evaluate teachers' competence with e-learning and vice versa.

Social influence (SI): is defined as the extent to which the students and teachers perceive a social pressure to use e-learning. This involves two factors:

i. Subjective norm – taps the perception that people who are important to him (teachers, students, colleagues, head of the department/institute) think he should or should not use e-learning.

ii. Image – captures the degree to which use of technology is perceived to enhance one's image or status in one's social context.

Facilitating conditions (FC): is defined as the extent to which the students and teachers perceive institutional support to use e-learning. This includes four factors:

i. ICT infrastructure --- availability and reliability of facilities.

ii. Institutional policies --- opportunities and incentives for use of e-learning.

iii. Training and support --- training to become efficient user of the technology and sustained technical assistance.

iv. Leadership --- role model and support from the head of the department and institute.

Behavioural intention (BI) refers to the individual's decision regarding future e-learning.

Actual usage (AU) taps the variety and frequency of technology used.

It is to be noted that in the context of a developing country the intention to use e-learning may not culminate in actual usage due to real world constraints. For example, a group of teachers and students may hold positive attitudes towards technology, but may not have access to it. Hence, we consider both the attitude (BI) as well as behavior (AU) to tap acceptance of technology.

PE, EE and SI determine BI which in turn determines AU. However, facilitating conditions has a direct effect on AU, since it gauges the real life constraints and facilitators in transforming the intention to action. In addition to the above, learning style of the student and teaching style of the teachers are considered as mediators affecting the relation between perceived usefulness and behavioural intention to use e-learning. These are discussed in the next section.

3.3. Mediators to acceptance of e-learning

One of the key advantages of e-learning is its adaptability. There is a lack of research on the influence of teaching style on acceptance of e-learning by faculty. Similarly, no study has considered students' learning style as a factor in e-learning acceptance. However, studies on e learning research have investigated the influence of learning style on the effectiveness and outcomes of technology-assisted learning (Hu, et. al. 2007; Rong & Min 2005). These studies have highlighted the features required in a particular learning management system to adapt to learner's disposition.

We postulate that the teaching/learning style of teachers/students will influence the perceived flexibility and interactivity of the system, thus influencing performance expectancy beliefs. In light of the above, we seek to explore the following:

- To what extent the learning style of student may affect the relation between PE and BI for students.
- To what extent the teaching style of the teacher may influence the relation between PE and BI for teachers.

A short description of the mediating factors --- learning style and teaching style --- follows.

Learning style: is the consistent learning way of learners. E-learning systems that deal with learning styles are a special case of adaptive educational systems, which focus on students' learning preferences as the adaptation criterion. There is a variety in the classification of students' learning style and instruments to measure it. Three scales assessing different learning styles have received the most academic attention: the Grasha-Reichmann Learning Style Scale (Hruska- Reichmann & Grasha 1982), the Kolb Learning Style Inventory (Kolb 1996) and the Solomon-Felder Index of Learning Styles (Solomon & Felder 2002).

For ELAM, a learning style index was needed that mirrored the teaching style index. Hence, the Grasha-Reichmann Learning Styles Scale is selected. The different learning styles (as assessed by this scale), along with its implication for e-learning are described below.

Three dimensions along which students' predominant learning preference varies are:

i. *Participant/Avoidant:* Students with a participant style are eager to learn course content, enjoy learning, and take responsibility for their own learning. Students with an avoidant style do not want to learn the content, do not enjoy learning, and avoid taking part in course activities.

Students with a participant style are more likely to do well in e-learning, which requires more effort on their part than the typical classroom. To reach students with an avoidant style, it is important to demonstrate how e-learning will benefit them.

ii. *Collaborative/Competitive:* Students with a collaborative learning style work well with others and enjoy cooperative learning and working in groups. Students with a competitive style see the classroom as a win-lose situation in which they must win and enjoy outperforming other students.

E-learning that stresses cooperative learning and group projects will appeal to students with a collaborative style. For students with a competitive style, e-learning delivery should provide opportunities for individual recognition. For example, instructional games or case study competitions will appeal to competitive learners.

iii. *Independent/Dependent:* Students with an independent style are curious and confident learners. They prefer to work on their own in individual activities. Students with a dependent style see the teacher as a source of information, want to be told what to do, and will learn only what is required. On the other hand, students with an independent style need opportunities for independent study, self-paced work, or special projects based on their interests. Students with a dependent learning style will need more guidance from the teacher.

E-learning that demands initiative from the student is more suited to independent learning style students. It is important to address the students with dependent learning style in an e-learning environment, as they may flounder without explicit instructor guidance.

In addition to the above learning styles, we postulate that in the context of e-learning, the following student preferences also need to be tapped.

iv. *Individualist/Collectivist:* Students with the individualist style prefer to learn without interaction with teachers and other learners. On the other hand, a collectivist prefers to learn in group. This dimension comes close to collaborative learning style.

E-learning that provides the learner access to all the resources and allows students to submit individual assignments will appeal to the individualist. For students with collectivist orientation, group discussions and collaborative activities will be suited.

However, since we are using a standard measure of learning style, this last dimension is not addressed in this paper.

Teaching style: is the consistent teaching way of teachers. It is determined by the following factors: i) students' learning styles, ii) students' capabilities to handle course demands, iii) need for teacher to directly control classroom tasks, and iv) willingness of the teacher to build and maintain relationships.

So far there has been no research on the influence of teaching style on acceptance of e-learning by faculty. Grasha (1996) identified five teaching styles that represented typical orientations and strategies college faculty use --- expert (displays detailed knowledge), formal authority (establishes learning goals, and rules of conduct), personal model (shows how to do things), facilitator (encourages students to make informed choices) and delegator (makes students work independently on projects or as teams). These styles converge into four different clusters that make up the characteristic ways teachers design instructional settings. The clusters along with implications for e-learning are described below:

i. *Expert-formal authority*: teacher-centered approach in which information is presented and students receive knowledge. The teacher wants to control the teaching environment. This style works best with students who are less capable with the content and who possess dependent learning styles.

E-learning tools that provide control to the teachers and require limited collaboration between the students, such as video recordings, will be suited to teachers with this teaching style.

ii. *Personal model-expert-formal authority*: teacher-centered approach that emphasizes modelling and demonstration. The teacher encourages the students to observe processes as well as content. This style works best with students who are active learners and possess participant learning styles.

E-learning tools that allow teachers to interact with students in real time, such as two-way video conferencing, are suited for teachers with this teaching style.

iii. *Facilitator-personal model-expert*: is a student-centered model for the classroom. Teachers design activities, social interactions, or problem-solving situations that allow students to practice the processes for applying course content. They do not want to control the specific details of the content student acquire. This style works best when students are willing to take initiative and possess collaborative styles.

E-learning tools that enable teachers to provide students with prescribed resources and well structured activities, such as discussion (with colleagues and faculty) using a Learning Management System (e.g. Moodle), will be suited to teachers with this teaching style.

iv. *Delegator-facilitator-expert*: is a student-centered model and places much of the learning burden on the students. Teacher provides complex tasks that require student initiative (often group work) to complete and gives up direct control over how learners engage various tasks and their outcomes. This style works best when students have appropriate levels of knowledge and possess independent learning styles.

E-learning tools that enable teachers to provide student's opportunities for mutual discussion, access to online resources such as Moodle, will be suited to teachers with this teaching style.

Effectiveness of e-learning is a function of student's learning style, teacher's teaching style and resources available. In a typical education environment, students' learning style cannot be controlled and the e-learning tools are governed by what is available. In such a scenario, it is the faculty that needs to adapt their teaching style so as to ensure high effectiveness of learning.

4. Contribution of the study

Most of the existing e-learning research has considered either the perspective of teachers or students. Our model of e-learning acceptance (ELAM) provides a more comprehensive view as it considers factors relevant to each key player in the education process. Further, existing research has considered participants from the West or developed countries of the East. The researcher provides a perspective that addresses the constraints in developing countries.

There is evidence to indicate that performance expectancy is salient for students while effort expectancy is most important for teachers in the e-learning acceptance. As the items of assessment are mirrored for the two groups in our study, empirical test of the model will

provide conclusive evidence for the difference between students and teachers. Besides, the instruments are generic to e-learning and can be easily adapted for testing acceptance of a particular e-learning tool or learning management system. However, they need to be empirically tested for psychometric analyses. A learning style is incorporated into the model and conceptualised a mediation role affecting performance expectancy beliefs of students. For teachers, teaching style is considered as playing a similar role for acceptance of e-learning by the teachers. The researcher proposes to test the ELAM model on teacher and student participants in a technology-enabled distance education programme.

This study has implications for policy decisions in the area of ICT use in higher education in developing countries. An empirical test of ELAM will provide insights into the country-specific factors that facilitate optimum utilization of e-learning resources by teachers and students. This will enable the government bodies and others interested in use of technology can ensure that the critical factors for acceptance of e-learning are addressed in the implementation process. Thus, the study contributes to the development of suitable pedagogical methods for e-learning content addressed to developing countries.

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APPENDIX

Table 1: Factors of e-learning Acceptance: Tools of Assessment

Construct	Dimensions	Items for students	Items for teachers	
Performance expectancy (PE)	Perceived usefulness	Using e-learning helps me to learn the topic.	Using e-learning helps me to teach the topic.	
		Using e-learning increases my chance of scoring higher marks.	Using e-learning increases my chance of positive evaluation of my teaching capacities.	
		Using e-learning in studies enables me to accomplish tasks (e.g. learn the topic, complete assignment) more quickly.	Using e-learning in teaching enables me to accomplish tasks (e.g. teach the topic, assess assignments) more quickly.	
		I find e-learning useful in my studies.	I find e-learning useful in my teaching.	
		Using e-learning increases the number of topics I can study per day.	Using e-learning in teaching increases the number of topics I can teach per day.	
		Using e-learning enhances my efficiency as a student.	Using e-learning enhances my efficiency as a teacher.	
		Using e-learning reduces my study load considerably.	Using e-learning reduces my work load considerably.	
	Interactivity	Using e-learning, I can interact with the teacher and get answers to my questions in reasonable time.	Using e-learning, I can interact with the students and clarify their doubts in reasonable time.	
		e-learning allows me to get information form online resources (e.g. wikipedia, Internet search engine).	e-learning allows me to get information form online resources (e.g. wikipedia, Internet search engine).	
		Using e-learning allows me to interact with friends and work together on assignments.	Using e-learning allows me to interact with group of students working on assignments.	
	Flexibility	Using e-learning allows me to choose topics to learn in order of my preference.	Using e-learning allows to choose topics to teach in order of my preference.	
		e-learning enables me to learn at my pace.	e-learning enables me to teach at my pace.	
		e-learning provides me the flexibility of studying the topic anytime, at any place.	e-learning provides me the flexibility to teach anytime, from any place.	
		e-learning enables me to learn lessons in the form that is adapted to my learning style.	e-learning enable me to lessons in the form that is adapted to my teaching style.	
	Effort expectancy (EE)	Ease of learning	Learning to use e-learning tools is easy for me.	Learning to use e-learning tools is easy for me.
		Ease of use	I find it easy to get e-learning to do what I want to do.	I find it easy to get e-learning to do what I want to do.

	It is easy for me to become competent at using e-learning.	It is easy for me to become competent at using e-learning.
	I find e-learning easy to use.	I find e-learning easy to use.
	My interaction with e-learning is clear and understandable.	My interaction with e-learning is clear and understandable.
	Using e-learning requires a lot of mental effort.	Using e-learning requires a lot of mental effort.
Self-efficacy	I possess the skills necessary to use e-learning tools.	I possess the skills necessary to use e-learning tools.
	Most of my teachers possess the skills to use e-learning	Most of my students possess the skills to use e-learning.