# The Influence of Experience, Ability and Interest on e-learning Effectiveness

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## Abstract

The purpose of this paper is to report the findings of a research conducted to evaluate the effect of learning preconceptions, prior e-learning experience, ability and interest of students on their perceptions regarding the process of e-learning. We study the effectiveness of e-learning as it relates to the level of e-learning experience. The participants came from two courses: Software business course at Tamk University of Applied Sciences in Tampere, Finland, and e-learning Professional course at Open University in United Kingdom. We use a quantitative and a qualitative research approach to interpret the results of this research study. The results imply that there are significant differences between the two groups regarding their perceptions of the effectiveness of e-learning. We provide specific recommendations for the practitioners, discuss the implications for educators, and provide suggestions for further research on e-learning.

## Keywords

e-learning, collaborative learning, learning effectiveness

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## Introduction

The traditional educational delivery system in universities and colleges has for a relatively long period of time been a classroom with a professor giving lectures to students and the students listening and taking notes. Interaction between the professor and students has been perceived to be a crucial learning ingredient in this delivery platform. Innovations in educational delivery mechanisms such as interactive and reflective schools of thought [1, 2] have, however, challenged the traditional approaches to education.

Progress in information technology has enabled new educational delivery methods such as distance learning and e-learning. As an outcome of this, many universities and colleges have entered this new e-learning world in a major way. For this reason the need for pedagogical and technical knowledge to teach using the Internet has emerged, and this knowledge is slowly becoming a core competence for many teachers. Given the proliferation of electronic mediated teaching, the essential question here is that how and to what extent are e-learning and the information technology changing the dynamics of teaching and learning [3]?

Some researchers have predicted that the traditional classroom will disappear [4, 5]. E-learning has entered the education as well as the corporate world in a major way and it also complements the traditional delivery methods. It has facilitated the traditionally difficult educational paradigms such as adult learning or distance learning.

It is suggested that "*The overriding question that must be addressed is how will these new educational delivery approaches that move away from the basic face-to-face relationship between a professor and students impact student learning and student perceptions of learning*" [6]; furthermore: "*At many institutions, the effectiveness of distance and on-line learning methodologies have not been well researched prior to adoption.*" While there appears to be much research on the various aspects of e-learning, the instructional requirements for the specific types of courses and the effect of e-learning experience, is relatively unexplored. For example, Häkkinen [7] studied challenges for the design of computer-based learning environments, but the approach is from overall instructional design perspective. Only relatively recently some research has emerged regarding the specific requirements of the various types of courses [8, 9, 10, 11]. Similarly, Fortune et al [12] made comparisons between online and traditional business communication courses in Silicon Valley. Also, the research by Negash et al [13] studies complex information systems class in an online environment. Finally McLaren [14] studied the persistence and performance of online and traditional classroom students.

In this research, we study students in two very different e-learning contexts: 1) Software business course at Tamk University of Applied Sciences in Tampere, Finland, and 2) e-learning Professional course at Open University in London, United Kingdom. Both courses are graduate level courses and the students differ in one very important dimension. The software business course for the Finnish students at Tamk University of Applied Sciences was their first experience with e-learning while the international students at the e-learning Professional course were experienced learners in the electronic environment. This study was conducted at two very different universities, one of them using traditional mode and one of them using the e-learning mode. The study of the use of e-learning in these different contexts should help us to better understand the dynamics of e-learning, and would also improve the generalizalibity of the results. Our objective is to better understand the interrelationship among learning presage variables (preconceptions,

prior e-learning experience, ability and interest) of students on their perceptions regarding the process of e-learning and furthermore on the effectiveness of e-learning.

## Pedagogical Framework

Bloom [15] developed a framework for various aspects of learning that includes comprehension, application, analysis, and evaluation. Students engaged in e-learning in our study experienced several aspects of learning including: Software development and e-learning Professional domain knowledge (learn the software development and e-learning techniques documented in the literature), Comprehension (grasp the meaning of the domain knowledge), Application (apply the domain knowledge to the implementation of software and e-learning development projects), Analysis (break down domain knowledge into its component parts and understand its organizational structure), Synthesis (assemble parts together to form a new whole), and Evaluation (judge the value of domain knowledge in specific case instances).

The pedagogical framework of both courses can be described as follows. Development of software business and e-learning environments are collaborative in nature [16] and thus, involve many experts such as business analysts, pedagogical experts, marketing managers, systems analysts, database developers, and programmers. The students define the issues typically in a project-like environment (in this case within the course) in a process-oriented and collaborative fashion [17]. The outcome consensus is reached through the discussion of the readings and progress reports from the subgroups of the students, who collaborate in learning the topics of the course. The process is guided, facilitated and moderated by the instructors and moderators. The projects in both courses require interaction and collaboration of all team members. The additional benefit of this arrangement is that adult learners can benefit from the experience of each other, which in fact can greatly contribute towards learning [18, 19].

The best results will be achieved when all stakeholders (e.g. learners, educators, external experts, customers, venture capitalists) collaborate and their concerns are addressed properly. The minimum level of collaboration would be to have the participants engage in the group discussions enabled by the e-learning virtual delivery platform (VLE). Furthermore, collaborative features like chat, message boards, threaded discussion, online conferencing, email, blogs and list serves were built into the collaborative technology that support delivering the course content. The VLE used at Tamk University of Applied Sciences was Moodle. The course at Open University used a proprietary VLE and software provided by various external providers like ePortaro for eportfolios and Movable Type for blogging.

## E-learning and Pedagogy

E-learning can be viewed as an alternative to the face-to-face teaching method or as a complement to it. E-learning usually allows the student a greater choice as well as responsibility for their own learning [20].

E-learning can change the methods of learning and has the promise to overcome the barriers of time, distance, and economics [21]. E-learning can be viewed as "*disruptive technology*" [22] and as a new paradigm for learning. Disruptive technologies look at problems in completely new and creative ways. E-learning challenges the traditional ways of teaching and learning, enables new alliances between various educational and commercial entities, and presents new ways of solving old problems. For example, the role of teachers is likely to change from importers of knowledge to facilitators of knowledge gaining process.

E-learning differs from traditional delivery methods based on two important dimensions: time and place. Table 1 summarizes possible cells that result from the combination of these two dimensions.

**Table 1.** Instructional mode matrix

|  |  | Place | |
|---|---|---|---|
|  |  | Same | Different |
| Time | Synchronous | Traditional method | Distance learning |
|  | Asynchronous | Recorded | E-learning |

Although the instructors may elect to use either or both of these communication modes, the proximity and time constraints can necessitate e-learning. The preference for asynchronous approach [23] reflects the trend in e-learning programs. The decision between synchronous and asynchronous mode of communication has significant impact on how interaction occurs [24]. Some view the knowledge constructed by learners through social interaction with others [25, 26, 27], focusing on the importance of interaction.

Synchronous, such as chat and conferencing requires the "physical" or "virtual" presence of participants at the same time. This has the benefit that collaboration is done in real time and delays of communication are avoided. Asynchronous, such as email, blogs, and threaded discussions have the advantage of allowing the students to access the learning resources any time. Asynchronous mode of communication is useful when parties have to communicate and share information (i.e. intermediate software progress modules) because in between of the interaction sessions, it is important to reflect and discover. Asynchronous interaction is also beneficial when students are geographically dispersed and it is difficult to assemble them at the same time. Reflection can reinforce and enhance learning. Reflection is a form of mental processing – a form of thinking – which we use to fulfil a purpose or to achieve some anticipated outcome. It is applied to relatively complicated or unstructured ideas for which there is no obvious solution; the equivocatility resulting from no "single" obvious solution to a software design project requires additional processing of knowledge and understanding and possibly display of emotions [28]. Group reflection is an extremely important part of helping students retain what they learn, provide feedback on their performance, and guide them on how to improve their performance on the next group situation [29].

## The Learning Experience, Process and Effectiveness Model

According to Cybinski and Selvanathan [10] high degree of interactivity and engagement are necessary requirements for effective learning at university setting by providing a motivating environment on a well-structured knowledge base. Knowledge has contextual meaning in theory of learning. This meaning is created through action, social interaction, and reflection [28, 30, 31].

The research question in this study is the extent to which the preconceptions, experience, ability and

interest of students affect the process of learning and how this also affects learning effectiveness? Biggs and Moore [32] have developed the 3P model of learning. The 3 P's stand for presage, process and product. The "Presage" part contains pre-existing student variables, and contextual and situational issues. In the "Process" section students perceptions regarding their learning environment are evaluated. These perceptions affect students' choices of learning strategies and how these strategies are implemented. The product segment contains the performance outcomes of the students. Table 2 has examples of representative variables used in learning models within each section [10]. In order to evaluate these relationships a modified version of the Bigg's [32] model is used in this research.

**Table 2.** The 3P Model of Student Learning

| Presage | Process | Product |
|---|---|---|
| Student variables, intellectual capability (IC) and abilities, prior knowledge, subject area, teaching methods, personality, culture, home background, time constraints, course structure. | Student motivation and behaviour, Student learning strategies. | Exam results, self-concept, grade point average, satisfaction. |

The modified version of the Bigg's model to be used in this study is presented in Figure 1. In the classroom setting the effectiveness of teaching and learning is typically based on the student performance, which is affected by individual attributes and educational setting [33, 34, 35]. The model of Bigg and Moore is one of the many models with the purpose to describe and identify the variables that have an effect on student learning outcomes. Another model has been developed by Busato et al [36].
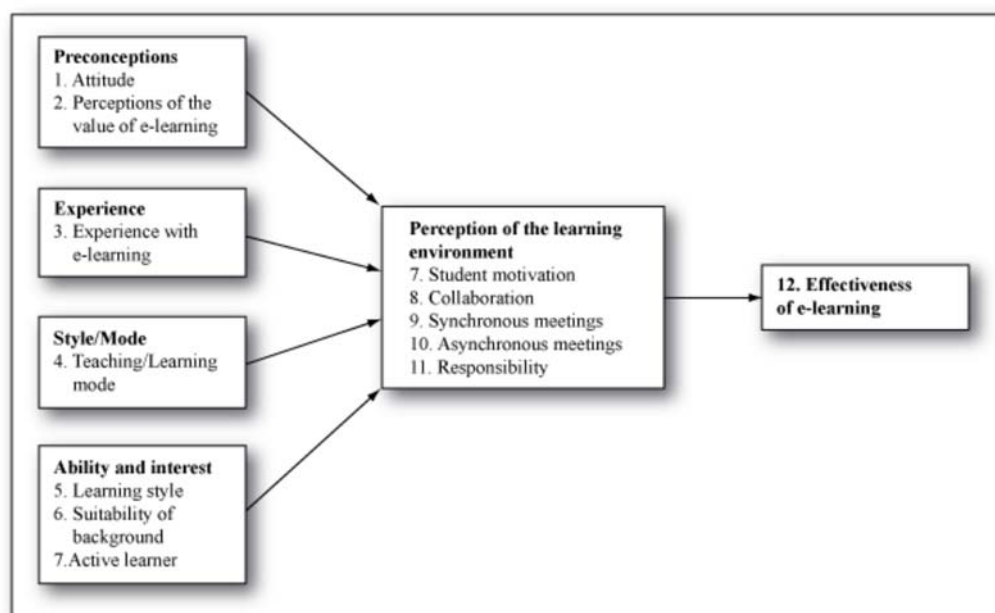


**Figure 1.** The student perception model

Similar to the Cybinski and Selvanathan [10], we used attitude and perception of the value of e-learning as preconception variables. The value of e-learning is measured by the speed of learning, improved and ease of learning as well as by improved productivity in learning. Level of experience was measured with the variable: perceived experience with e-learning. Teaching and learning mode was not applicable in this research, because e-learning mode was used in both cases. Finally, contrary to the Cybinski study, ability and interest in e-learning were used as variables and they were measured with learning style suitability to e-learning, suitability of the student background to e-learning and whether students' perceived themselves as active learners and self-starters [37, 38].

In the Cybinski study a closed-book exam at the end of the study semester was used to measure overall teaching and learning effectiveness. In this study, the evaluation of the performance was not possible, nor was it relevant because the assessment criteria were not comparable between the two universities. Instead the students' perceptions of the effectiveness of e-learning was used as a measure of teaching/learning effectiveness. Cybinski points out that there is growing evidence that student performance in subject area assessment does not provide a reliable indication of the quality of student learning [10, 39, 40, 31].Therefore student motivation, collaboration, need for synchronized meetings, need for asynchronous meetings and students' perceptions regarding responsibility of the individual student in the learning mode are used to evaluate the quality of the student learning experience as an intermediate outcome or product in the model. This method complements the approach of Cybinski and Selvanathan to use enjoyment and assessment anxiety.

Figure 1 suggests preconceptions about the importance of e-learning such as the learning style/method and the attitude towards e-learning and the value of e-learning, and the level of prior e-learning experience, and the ability and interest in e-learning impact the learning experience, which on the other hand will have an effect on the students' perceptions regarding e-learning. These interrelationships are studied here using the modified Bigg's model as a framework.

In the following section we present the descriptive details of the data followed by the introductory data analysis, and with the description of model variables. This is followed by the analysis section with qualitative data. Finally, the discussion section includes summary of the findings, the limitations, and conclusions.

## Data Analysis: Descriptive Details

The research was conducted using an Internet-based survey in the middle of both courses during Fall 2006. The participants in both cases were working adults at Tamk University of Applied Sciences (TPU)

pursuing the Upper Level Polytechnic University degree, and others enrolled in the e-learning Professional class at Open University (OU).

The research survey included questions about the general characteristics of the students and questions relating to students' past learning experience (see Appendix A). A seven point Likert type scale was used.

There were altogether 39 responses out of which 14 came from OU and 25 from the TPU. The average age of all respondents was 40.3 years, and it was 36.3 years among the students in the Software Business course (TPU) and 47.4 years among the students in the e-learning Professional course (OU). In both universities the number of female respondents was larger (11 out of 13 at the e-learning Professional and 16 out of 25 at the Software Business course) than male respondents. This reflects reasonably well the student population of the graduate programs of both universities.

## Data Analysis

Table 3 provides the mean responses regarding the perceived effectiveness of e-learning for both groups. As shown in Table 3, the difference between genders is not significant.

**Table 3.** Perceived mean responses regarding the perceived effectiveness of e-learning by gender in both universities

| Group | Male (SD) | Female (SD) |
|---|---|---|
| OU (1) | 3.00 (1.00) | 3.45 (0.69) |
| TPU (2) | 3.88 (0.60) | 3.75 (0.77) |
| All | 3.67 (0.78) | 3.63 (0.74) |

We performed an ANOVA to test the difference between the mean scores of both genders and found a p-value of 0.89. Hence, there is no difference at a .05 level of significance. Therefore, we can conclude that both gender groups are similar regarding the perceived effectiveness of e-learning.

## Attitude variables

In order to measure students' perceptions towards e-learning the following variables were used: Attitude towards e-learning, value of e-learning, ability and interest in e-learning, learning environment, and effectiveness of e-learning.

Value is measured as worth in usefulness or importance to the user, and is measured in this case by faster, improved, and ease of learning, and improved productivity in learning. The correlation between these variables was very high as shown in Table 4. In addition, the Cronbach alpha was checked for both universities and they were 0.83 and 0.77 for OU and TPU respectively indicating both groups were in agreement in the way they perceived these items. Therefore, these four variables were combined into one single variable called "Value" by calculating the mathematical mean of the variables.

Ability and interest, while difficult to measure [10] was measured in this case by the suitability of the learning style to e-learning, suitability of background to e-learning, and perception of students regarding them to be active learners and self-starters. Again the Cronbach alpha test was performed and they were 0.25 and 0.74 for OU and TPU respectively. It was decided, however, to leave the variables as they are since they efficiently differentiate the two universities (Table 5), which probably explains the reasonably high Cronbach value.

Perception of the learning environment was measured using the following variables: Student motivation, contribution of collaboration towards learning, need for synchronized meetings, need for asynchronous meetings, and perception regarding the responsibility of the student in the learning environment. The Cronbach alpha test was performed and they were low, 0.10 and 0.26 for OU and TPU respectively, as expected.

## Prior e-learning experience

The level of perceived experience in e-learning is expected to influence the process of e-learning and subsequently the e-learning effectiveness.

## Analysis and Results

### Exploratory data regarding the measured variables

The relationships between the variables in this study are presented in Table 4 for all respondents from both universities. In case the p-value is less than 0.05, there is a statistically significant correlation between those two variables.

Attitude appears to be significantly correlated to perceived value of e-learning (r=0.434; p=.006), prior e-learning experience (r=0.373; p=.019), suitability of learning style to e-learning (r=0.458; p=.004), active learning (r=0.450; p=.004) and need for asynchronous meetings (r=0.616; p=0).

Value of e-learning is positively correlated to learning style (r=0.697; p=0). Prior e-learning experience appears to be positively correlated to learning style (r=0.345; p=.032).

Furthermore learning style appears to be positively correlated to suitability of background to e-learning (r=0.340; p=.034), active learning (r=0.552; p=0), motivational level (r=0.516; p=.001) and contribution of collaboration towards learning (r=0.369; p=.021).

Active learning appears to be positively correlated to motivational level (r=0.583; p=0) and need for synchronous meetings (r=0.322; p=.046). The contribution of collaboration towards learning is positively correlated to the individual responsibility in the learning environment (r=0.595; p=0).

Finally, the need for synchronous meetings appears to be positively correlated to the need for asynchronous meetings (r=0.356; p=.026) and negatively correlated to individual responsibility in the

learning environment (r= -0.445; p=.005).

**Table 4.** Correlation coefficients and their p-values

|  |  | Atti-tude | Value | Expe-rience | Learning style | Back-ground | Active learner | Moti-vation | Collabo-ration | Synchro-nous | Asynchro-nous |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **Attitude** | 1.000 | 0.434 | 0.373 | 0.458 | 0.147 | 0.450 | 0.176 | 0.195 | 0.067 | 0.616 |
|  |  | (0.000) | (0.006)** | (0.019)* | (0.004)** | (0.373) | (0.004)** | (0.285) | (0.234) | (0.683) | (0.000)** |
| 2 | **Value** |  | 1.000 | 0.299 | 0.697 | 0.312 | 0.273 | 0.254 | 0.185 | 0.030 | 0.311 |
|  |  |  | (0.000) | (0.065) | (0.000)** | (0.053) | (0.093) | (0.119) | (0.260) | (0.855) | (0.054) |
| 3 | **Experience** |  |  | 1.000 | 0.269 | 0.345 | 0.068 | -653.000 | -0.012 | -0.006 | 0.169 |
|  |  |  |  | (0.000) | (0.098) | (0.032)* | (0.680) | (0.969) | (0.469) | (0.971) | (0.302) |
| 4 | **Learning style** |  |  |  | 1.000 | 0.340 | 0.552 | 0.516 | 0.369 | -0.134 | 0.188 |
|  |  |  |  |  | (0.000) | (0.034)* | (0.000)** | (0.001)** | (0.021)* | (0.416) | (0.252) |
| 5 | **Background** |  |  |  |  | 1.000 | -0.079 | 0.216 | -0.033 | -0.133 | -0.234 |
|  |  |  |  |  |  | (0.000) | (0.632) | (0.186) | (0.840) | (0.418) | (0.152) |
| 6 | **Active learner** |  |  |  |  |  | 1.000 | 0.583 | 0.260 | 0.177 | 0.322 |
|  |  |  |  |  |  |  | (0.000) | (0.000)** | (0.111) | (0.281) | (0.046)* |
| 7 | **Motivation** |  |  |  |  |  |  | 1.000 | 0.056 | 0.223 | 0.132 |
|  |  |  |  |  |  |  |  | (0.000) | (0.734) | (0.172) | (0.421) |
| 8 | **Collaboration** |  |  |  |  |  |  |  | 1.000 | -0.285 | 0.092 |
|  |  |  |  |  |  |  |  |  | (0.000) | (0.079) | (0.576) |
| 9 | **Synchronous** |  |  |  |  |  |  |  |  | 1.000 | 0.356 |
|  |  |  |  |  |  |  |  |  |  | (0.000) | (0.026)* |
| 10 | **Asynchronous** |  |  |  |  |  |  |  |  |  | 1.000 |
|  |  |  |  |  |  |  |  |  |  |  | (0.000) |
| 11 | **Responsibility** |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 12 | **More effective** |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |

*) $p<0.05$ **) $p<0.01$

Evaluating the differences between the more experienced (OU) and less experienced students (TPU)

In this section the mean differences between the respondent groups were tested for the above variables using the t test. Table 5 illustrates the summary measures of the variables, the t-test statistics values and their matching p-values of the tests between the more (OU) and less (TPU) experienced students in the e-learning environment.

**Table 5.** Summary statistics and t-tests of difference between the more and less experienced groups in the e-learning environment

| Variable | Mean (SD) | | Test of Equality | |
|---|---|---|---|---|
|  | Group 1 | Group 2 | Test Statistic | p-Value |
| 1. Attitude towards e-learning prior entering the course | 6.07 (0.83) | 5.08 (0.91) | 3.46 | **0.002**) |
| 2. Value of e-learning | 4.75 (1.46) | 4.24 (0.77) | 1.27 | 0.240 |
| 3. Experience with e-learning | 3.64 (2.02) | 3.28 (1.88) | 0.55 | 0.587 |
| 4. Learning style suitability to e-learning | 5.64 (1.39) | 4.68 (1.14) | 2.20 | **0.038*)** |

| | | | | |
|---|---|---|---|---|
| 5. Background suitability to e-learning | 4.86 (2.28) | 5.28 (1.06) | -0.65 | 0.528 |
| 6. Active learner and self-starter | 5.93 (1.14) | 4.76 (1.09) | 3.11 | **0.004**)** |
| 7. Motivation | 5.86 (1.10) | 5.64 (0.99) | 0.61 | 0.546 |
| 8. Collaboration | 4.64 (1.59) | 4.48 (1.19) | 0.33 | 0.743 |
| 9. Need for synchronized meetings | 5.43 (1.16) | 4.72 (1.40) | 1.70 | 0.100 |
| 10. Need for asynchronous meetings | 6.36 (1.01) | 5.00 (1.08) | 3.92 | **0.001**)** |
| 11. Responsibility | 5.29 (1.90) | 5.92 (1.22) | -1.13 | 0.274 |
| 12. More effective | 3.36 (0.75) | 3.80 (0.71) | -1.81 | 0.081 |

*) $p < 0.05$  **) $p < 0.01$

There were no significant differences between the two groups for the following variables: value of e-learning, experience with e-learning, background suitability to e-learning, motivation, contribution of collaboration towards learning and individual responsibility in the learning environment.

The respondents were similar both at the OU (Group 1) and TPU (Group 2) as regards to their motivational level. This finding is consistent with Mancuso-Murphy's [41] and Vaughan's [42] findings that suggest that an individual in the e-learning environment needs to be autonomous, self-directed, motivated, self-disciplined, assume responsibility for his or her own learning, and should possess time management skills and should not procrastinate. Also both groups were in agreement regarding the value of e-learning, which is a consistent finding with prior research [42, 43, 44]. To triangulate the quantitative findings with qualitative evidence, we provide the following sample student comment as an illustrative example.

> "I should be able to work when I have time available - i.e. fits in with my work commitments and domestic issues."

The course design in both courses used collaborative technologies like computer conferencing extensively. Contribution of collaboration towards learning was perceived to be important by both groups, which is consistent with the finding in the literature. Communication in collaborative engagements like learning and virtual software business development is an important challenge, particularly in the virtual environment. A major difference between working with co-located team members or with remote team members is "social presence" [45]. Different degrees of social presence can be attributed to different forms of communication media [46]. Social presence is the cognitive synthesis of such factors as physical appearance, posture, facial expression, direction of looking, and the feeling of trust as perceived by the individual to be present in the medium [46]. A communication mode that is low in social presence is characterized as unsociable, insensitive, cold, and impersonal. These factors may influence how individuals collaborate. Research has shown that Face-To-Face (FTF) channel is highest in social presence followed by video, multi-channel audio, speakerphone, and written text [46]. Computer Mediated Communication (CMC), like computer conferencing, may diminish social presence by reducing the number of channels that are used for personal interaction and may promote dysfunctional gaming behaviour when the incentives are incongruent [45]. Students in interactive e-learning courses may avoid using media with low social presence for interactions they perceive to require higher social presence. We believe that when student incentives are congruent and synergistic (i.e., one can learn from others as a result of group work and we will all be better off), the dysfunctional gaming behaviour will not manifest and the collaborative environment will be conducive to learning as illustrated by the following comments.

> "I think the collaboration using conferences has been absolutely essential and a really good feature of the course."

> "On the other hand the collaboration in the project assignment has been very productive and innovative (partially because the group members are all highly skilled). The idea of getting feedback from other students itself is a good one."

> "This group work thing has been really good."

> "Although we are physically remote it feels as if we are a learning community and we are able to share ideas and knowledge in a beneficial way."

> "The use of the bulletin board system, and the use of eportfolios and blogs to share your work with lecturers and others have made the course a success."

> "Blogging added an extra opportunity for collaborative reflection, which I found beneficial."

> "There are a lot of participants - this is good because there are a lot of different opportunities to learn about other people's viewpoints."

Even though the collaboration was felt to be an important feature of the course, having a clear structure and guideline is important. When task ambiguity is perceived to be high in absence of clear structure and guidelines, students can become negative about the "lean" electronic communication used in e-learning environment. The lean channel can make the resolution of ambiguity and uncertainty more difficult in collaborative groups relative to those groups who use the "rich" face-to-face media. Some of these feelings are illustrated by the following comments.

> "I don't think we need to do this (sharing experience) in so many ways i.e. first class, wikis, and blogs. One or two would be sufficient."

> "Perhaps, there should be more clear directions about collaborative tasks, because, at least, in my case, I feel a bit lost about what to do and how to do it."

Creating a social learning environment through collaborative e-learning can foster reflective response and support collaborative construction [47], which was the aim in both courses of this research. Adult educators often emphasize collaborative learning as a way to enhance critical thinking skills [48]. In our

study, the course design and technology using collaborative conferencing were appropriate for supporting collaborative learning and enhancing critical thinking; the students indicated the importance of e-learning as a way to enhance collaborative activities and critical thinking.

We expected that the respondents would perceive the responsibility of the student to be greater in the e-learning environment than in the traditional classroom setting. This proved to be the case by both groups, and especially by the OU students. The responses to this question are consistent with the findings of Mancuso-Murphy [41] as well as Knowles [18] who concluded that the learner must assume responsibility for his or her own learning. In the words of Huang [48]: *"...the learners move from passive receivers to control their own learning."* The added responsibility issue was seen as positive as demonstrated by the following comment.

> *"Taking personal responsibility for interpreting the various papers was useful."*

There were, however, significant differences between the two groups regarding attitude towards e-learning prior to entering the course, learning style suitability to e-learning, perceived level of learning activity and need for asynchronous meetings at the level of 0.05. The difference between the two groups was also somewhat less significantly different regarding the need for asynchronous meetings at the 0.10 level.

The expected finding was that the OU students (Group 1) would have more positive attitude towards e-learning because of more experience in the e-learning environment. This was also the case. Attitude has been shown to be one of the key indicators of success in online training [49].

The importance of learning styles in the teaching and learning process has long been acknowledged [25] and it has raised a lot of discussion lately [49]. Poole [50] indicates that learning styles affect students' attitudes to pursuing online courses and this is important for the development of web-based courses. The correlation between learning styles and attitude was very strong in this study as well (see Table 4) confirming the findings of Poole [50]. In this study the learning styles were not evaluated in detail like in the Poole [50] study. It might be a good idea to investigate this matter in more detail in a similar framework later since Poole [50] found that the various learning styles can be useful in predicting the kinds of web-based activities likely to be valuable to the individual needs of the students. Coffield et al [51] questioned the usefulness of the construct of learning styles on the basis of validity and reliability of instruments developed to measure the learning styles. Sharing the view of Heaton-Shrestha et al [52] the view was taken in this study that learning style is a useful construct. Consequently many students have different ways of learning both in the traditional as well as in the e-learning mode. In other words every individual has a unique learning style, which is affected by personal qualities that influence the ability to obtain information and to interact with the peers and to participate in learning experiences [53, 54]. Furthermore, some people have an active and interactive learning style, others concentrate on facts, some prefer visual information, and some learn from written and verbal clarification [55]. According to Mupinga et al (2006) there were no particular learning style found to be predominant among the college students in their study, and therefore the design of learning activities should strive to accommodate multiple learning styles. This is probably the case in this study as well. Mupinga et al [56] also suggested various strategies to accommodate this. James and Gardner [57] propose that individual learning styles are developed as an outcome of heredity, experience, and current environment. Both groups in this study indicated their learning style to be suitable to e-learning thus identifying and recognizing the requirements of e-learning. Felder [55] mentioned that students whose learning styles are compatible with the teaching style in the course tend to preserve information longer, apply it more effectively, and have more positive attitude after the course. The OU students in this study perceived their learning styles to be much more suitable to e-learning than the TPU students. This is probably due to the fact that their e-learning experience is much stronger.

The perceived level of being an active learner was expected to be high in both groups. Also it was expected that the OU students would perceive themselves to be more active learners and self-starters than the TPU students. Both of these expectations were also found to be true. Learners must learn to manage, analyze, critique, cross-reference and transform information into valuable knowledge [58] by being active learners. Having an active learning style in the online environment has been shown to be important [41, 59, 60]. Although both groups indicate to be active rather than passive learners, the OU students perceive themselves to be significantly more active learners, and thus this might have an impact on their responses [61]. The finding that the OU students perceived themselves to be more active learners that the TPU students is consistent with Jordanov's [62] study in which she discovered that learners adopted and developed more active modes of learning when they used the Internet.

Regarding the need for synchronous and asynchronous meetings both groups felt quite strongly for the need for these meetings. This finding is consistent with Heaton-Shrestha et al [52] who concluded in their study that students had a preference for a blended approach (i.e. one combining both on-campus and virtual learning) indicating that this had to do both with discipline issues and preference for physical interaction with learning materials and other resources. Somewhat surprisingly the OU students felt more need for synchronous (and to certain extent) also asynchronous meetings during the course than the TPU students. One would have expected that because of more experience, the OU students, knowing the nature of e-learning, would feel the opposite. Synchronous and asynchronous discussions enable individuals to focus on the development of knowledge-building communities where participants share information in the pursuit of a meaning, and reflect on the knowledge that they have constructed [63]. The need for the meetings may be explained by the fact that face-to-face or virtual contact may help in resolving conflicts, developing trust, and establishing a shared cooperative context [64, 65]. A shared cooperative context may be more necessary in Software Business course than in the e-learning Professional course. In many cases personal relationships may be the key mechanism for coordinating complex business processes such as collaborative software business development. In the absence of rich communication media, collaborative technology should provide features such as shared spaces, real-time chat facilities, and the ability to communicate emotions using icons (i.e. smiley face) that alleviate the shortcomings of the communication media with low social presence. Alternatively, policies and mechanisms may need to be developed that would still allow the team to function effectively despite low social presence [45]. The following sample comments by students provide support for the need for additional physical meetings.

> *"It would have been good if a pre-course meeting could have been organized and clarify the course procedure."*

> *"A start-up meeting (e.g. the first lesson) would have been good."*

> *"There should have been some kind of kick-off lecture in real life to get the team members know each other. Now it took a lot of (wasted) time to gather the group together."*

> *"It would have been advisable to kick start the course with one face-to-face meeting with the*

*participants. In this meeting the general guidelines and procedures of the course could have been explained in much more clear manner than in the Moodle course info."*

*"First time should have been face-to-face and all the contents etc. of the course should have been explained clearly."*

Many researchers have made comparisons regarding the effectiveness of online learning and face-to-face learning [66]. Nobody has, however, tried to assess the effect of e-learning experience of the perceived effectiveness of learning in online environment. In this research, one would have expected that the OU students would perceive the effectiveness of e-learning to be higher than the TPU students. This was, however, not the case with the significance level of 0.10. Thus the somewhat dramatic conclusion is that longer experience in the e-learning environment does not automatically lead to higher perceived effectiveness of e-learning.

In spite of the slight lack of support for the effectiveness of e-learning by both groups, the qualitative comments below show that many students found e-learning environment to be very conducive and effective to learning.

*"I've got many very interesting links from the teacher and other students that may not have gone in to my mind."*

*"I think it was successful because of the content and tools we are learning and how tutors are helping us."*

*"We are using and gaining experience with quite a good range of the technologies currently available for e-learning."*

*"I think that after this course I will have a good knowledge of how to deal with ePortfolios, wikis, blogs, podcasts, etc."*

*"Positive and innovative use of technology, with very little gaps for lack of understanding."*

Also regarding the effectiveness of learning in the online mode the following comment was noteworthy. The need to be a good writer is probably very important in the online environment.

*"One has to be good at expressing himself in writing."*

According to Cereijo [67] and Fortune [12], there is no support for the assumption that online courses are more effective than face-to-face instruction, and the findings of this research support that outcome. The assumption that both environments are equally effective is documented in prior literature [68]. Course-delivery medium is rarely the determining factor of educational outcomes such as student satisfaction perceptions and learning according to Russell [69].

## Discussion

E-learning can provide a versatile learning environment, which many companies and educational institutions have adopted since the emergence of the Internet. This study concentrated on the effect of learning preconceptions, prior e-learning experience, and the ability and interest of students on their perceptions regarding the process of e-learning and consequently on the effectiveness of e-learning. We used the level of e-learning experience as a dependent variable in interactive and collaborative e-learning courses. The courses were conducted at two universities, namely Open University in the United Kingdom and Tamk University of Applied Sciences in Finland. The courses were e-learning Professional, and Software Business respectively. There were differences in perceptions regarding preconceptions, experience, ability and interest ("*presage*") of students, perceptions of the learning environment ("*process*") and perceived effectiveness ("*product*") between the two groups who had different levels of experience with e-learning, indicating that the more experienced students perceive themselves to have more positive attitude towards e-learning, and also that their learning style is more suitable to e-learning. Also the more experienced students perceived themselves to be more active learners and self-starters.

As regards to the process of e-learning, there were also differences between the two groups of students with different e-learning experience regarding their perceptions of the learning environment. In this study the learning environment included the following variables: motivation, collaboration, synchronous and asynchronous meetings as well as individual responsibility. Dunn and Dunn [70] mentioned that there is a relationship between the learning environment and the learning style by indicating that a core concept of learning styles is how people react to their learning environment. In spite of the fact that the perceived learning styles differed between the two groups, the only differences regarding the learning environment was perceived in the need of synchronous and asynchronous meetings, but somewhat surprisingly so by the more experienced students in e-learning.

Finally, we found a somewhat statistical difference between the two groups regarding the effectiveness of e-learning ("*product*"). Surprisingly the more experienced students felt e-learning to be less effective than the less experienced students. Why this is the case? Both courses were conducted for the first time, and thus the learning environment was at least somewhat new for both groups. One factor that could have caused this is that the OU virtual learning environment included more and newer external applications, which were not fully tested and operational at times while the TPU VLE was a single uniform VLE (Moodle). It might be that the OU students felt that these new applications decreased the effectiveness of e-learning. This was also confirmed by an OU student as follows:

*"It is a badly organized OU course and I feel like a guinea pig."*

Our qualitative study and interpretive analysis illustrate several factors such as experience, active learning, and collaborative social learning, which have implications for the design of effective e-learning. The results of this study have implications for theory and practice of e-learning. The results suggest that when all the elements in the Bloom taxonomy for learning are used in the interactive and collaborative courses with an emphasis on the higher levels of learning, the experience of students in the e-learning mode has implications for the design and procedures for the conduct of effective e-learning.

When the students lack the experience in e-learning, it is important that the procedures, software tools, and materials are well-organized and expectations are explained in detail before the course starts, preferably in a special physical face-to-face setting, so that students can check whether e-learning is suitable for them or not. In addition, it is important to explain for the students that learning in e-learning

mode is more the responsibility of the student than perhaps would be the case in the traditional learning mode. Students should be encouraged to assume an active role in their learning especially in the e-learning context. Since time management is an important element in any, but especially in an interactive and process-oriented course, it is important to emphasize for the participants the meaning of schedules in order to gain full advantage of e-learning and collaboration.

Collaboration should be an important element in an interactive and process-oriented course because it facilitates learning from others in a collaborative learning context to improve critical thinking skills. In case projects are used as learning assignments they should be tailored to meet the needs of the participants and in consideration with the potentials and limitations of e-learning. The schedule should be accommodative enough; not too demanding and not too loose, but expectations should be clear and proper milestones should still be set with specific time frames. Students should be informed that the deadlines and schedules should be taken seriously. Enhancement of critical thinking and reflection should also be an important element in an interactive and process-oriented course. This can be achieved by peer-to-peer assessment of assignments and conferencing in a team environment.

The inclusion of learning options that require the learners to use up-to-date information is essential in an interactive and process-oriented course in order to take full advantage of e-learning. Because of the asynchronous communication and time delays for responses, continuous feedback by the facilitator is an important element of an interactive and process-oriented course in e-learning context where the visible social contextual cues are filtered in the absence of the face-to-face synchronous communication.

E-learning is a relatively new area of research and has only emerged since the evolution of Internet. The expectations have been enormous regarding the use of e-learning in universities and colleges as well as in many corporations. Many universities have quickly adopted this new platform with vengeance. Also some large global corporations are using e-learning as a main delivery platform of corporate education. Future research should develop sound theoretical foundations for e-learning that can explain the cognitive dynamics of learning in this context. For example, are there some personality traits or cognitive styles that are more appropriate for e-learning context?

While we found interesting results about e-learning, the reader should be cautious about extending the results of this study to other e-learning contexts beyond those that define the current study. Future research should extend the study of e-learning by focusing on e-learning contexts such as pure e-learning or mixed mode and various types of technological software for collaborative e-learning. Also, while students in this study were all graduate students, it would be interesting to study the effect of e-learning on undergraduate students. Conducting similar studies in different countries with different cultures can also provide insights on how to develop culturally sensitive e-learning methods. For example, the influence of e-learning may be different for students in Western cultures such as United Sates (i.e., cultures that promote individualism and student-centered learning) than for those in Middle East, or Pacific basin and Asian cultures (i.e., cultures that promote a collectivism and teacher-oriented learning). Finally, developing more theoretical frameworks for e-learning along with more metrics for e-learning process and outcomes can help advance the state of knowledge about e-learning.

In this research, we focused on a particular aspect of e-learning: perceptions regarding preconceptions, experience, ability and interest ("*presage*") of students, perceptions of the learning environment ("*process*") and perceived effectiveness ("*product*") between the two groups who had different amount of experience with e-learning. Future research should expand on this work and test the results of this research in a larger scale and in different cultures. For example, is e-learning dynamics different for Europe, North America, Asia, and Middle East where face-to-face interaction and social presence may be different? This may require the use of studies in consecutive courses or even a whole program of study utilizing e-learning longitudinally.

Furthermore, while we used Bloom's taxonomy in this study, there are also different kinds of pedagogical settings that could be researched. The Bloom's taxonomy could be used and expanded as a basic framework for the establishment of the setting of future research studies. In this study the higher levels of the Bloom taxonomy were used as a framework but future research can study the outcome(s) in other levels of the framework and extensions of this framework may be useful directions for future research.

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## Appendix A: Questionnaire

### Characteristics of the student

1) Age, please specify _____.

2) Gender

a) Male

b) Female

**Presage questions: Attitude**

3) The attitude of the student towards e-learning prior entering the class.

1...........2...........3...........4...........5...........6...........7

Poor                                        Excellent

**Presage questions: Value**

4) e-learning enables me to accomplish learning more quickly.

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

5) e-learning mode improves my learning.

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

6) The use of e-learning makes learning easier for me

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

7)     Using e-learning improves my productivity in learning.

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

**Presage questions: Experience**

8) Experience with e-learning

1...........2...........3...........4...........5...........6...........7

Poor                                        Excellent

**Presage questions: Ability and interest**

9) My learning style is suitable for e-learning.

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

10) My background and education are particularly suitable to e-learning.

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

11)    I am an active learner and self-starter.

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

**e-learning process questions**

12) My motivational level is high

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

13) The collaboration with the fellow students contributed greatly towards learning.

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

14) There is a necessity and benefit for synchronized meetings (i.e. the use of chat and conferencing) in this class.

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

15) There is a necessity and benefit for asynchronous meetings (i.e. E-Mail, blogs, threaded discussions).

1...........2...........3...........4...........5...........6...........7

Completely disagree                     Completely agree

16) The responsibility of the student in the e-learning mode in comparison to traditional mode of teaching delivery is far greater.

1..........2...........3...........4...........5...........6...........7

Completely disagree                    Completely agree

17) Most participants believed that e-learning is more effective than traditional methodologies.

1..........2...........3...........4...........5...........6...........7

Completely disagree                    Completely agree

Open-ended questions

18) Please describe with your own words what specific features of the class made this e-learning course a success? For example could more have been done to foster collaboration? _____

19) Please describe with your own words what specific features of the class made this e-learning course a failure? _____