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How undergraduate students meet a new learning environment?

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Abstract

We evaluated if the theory of planned behavior explains students' activity in a web-based learning environment. Two of the considerations of the theory, attitude toward the behavior (behavioral beliefs and outcome evaluations) and perceived behavioral control (computer self-efficacy), were evaluated. The scope was also widened to students' approaches to learning and anxiety in computer using situations as well as their interpretations of the environment and the learning situation. Forty-two undergraduate medical and sociology students completed the questionnaire assessing attitudes, self-efficacy, anxiety and approaches to learning before and after the web-based courses. The attitude toward the behavior, efficacy beliefs, approaches to learning and anxiety in computer using situations did not predict the activity in the learning environment, but students interpreted the environment and the learning situation more negatively after the courses. Students' anxiety and approaches to learning also affect some of their expectations and experiences after the courses.

Keywords: Attitudes; Self-efficacy; Anxiety; Approaches to learning

1. Introduction

Teaching in traditional Finnish higher education relies in many respects on lectures. Lectures are common especially in early years, because of the large number of students enrolled in basic studies. That is why students are also used to lectures and other traditional teaching methods. Over the past few years, however, some

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departments have started to substantially diversify their educational methods. Nowadays, together with other educational innovations such as problem-based learning, using technology in instruction is playing an increasingly important role in higher education.

Despite the potential enhancements resulting from technology use, the transition into a novel learning environment might be challenging. Attitudes are often conservative in educational world and students feel more comfortable with traditional educational methods. There is often resistance to change. The change process is influenced not only by what the teachers do, but also how the students perceive and interpret what is done (Hall & Hord, 2001). These varied interpretations can contribute to unintended effects and affect the change process in a significant way (Hall & Hord, 2001). Each individual develops their own interpretations based on their past experiences. That is why students' appropriate use of the technology may be limited due to their negative attitudes toward the instruction that is not consistent with their past experience (Åkerlind & Trevitt, 1999; Shaw & Marlow, 1999). Recent studies (e.g. Dewhurst, Macleod, & Norris, 2000; Monteith & Smith, 2001) have shown that although students' opinions on technology are generally positive, there is still overwhelming preference for face-to-face contact in lectures.

At the same time students' activities in and interpretations of new, technologically rich learning environments have not been adequately analyzed at the individual level. Moreover, as Järvelä, Lehtinen, and Salonen (2000) remark, many instructional designers have assumed that every student interprets the features of a learning environment in an ideal way. It is, however, evident that each student interprets a new learning environment and learning situation differently depending on his or her individual experiences. In this article the consequences of transition to a novel learning environment are discussed on the level of *beliefs*, *learning approaches* and *emotions* in individuals' behavior. The study is focused on analyzing how students with different behavioral and efficacy beliefs, learning approaches and levels of anxiety in computer using situations meet a new learning environment and consequently interpret the learning situation.

2. The role of beliefs in human behavior

The theory of planned behavior (TPB) (Ajzen, 1991, 2002a) has emerged as a promising framework for the study of human behavior, including technology adoption and usage (e.g. Venkatesh, Morris, & Ackerman, 2000). Its earlier version, the theory of reasoned action (Fishbein & Ajzen, 1975) has also been tested in several studies where computer usage is accounted for beliefs, attitudes and intentions (e.g. Bagozzi, Davis, & Warshaw, 1992; Koslowsky & Hoffman, 1990; Pancer, George, & Gebotys, 1992). The central factor in TPB is the individual's *intention* to perform some behavior. In TPB intention is defined as a function of three kinds of considerations: beliefs about the likely consequences of the behavior (*attitude toward the behavior*), beliefs about the normative expectations of other people (*normative beliefs*) and *perceived behavioral control* i.e. perceived ease or difficulty of performing the behavior (Ajzen, 1991, 2002a). In combination, attitude toward the behavior, normative beliefs and perceived behavioral control lead to behavioral intention (Ajzen, 1991, 2002a). However, the relative importance of these three factors in prediction of person's intention varies across different behaviors and situations (Ajzen, 1991).

2.1. Attitude toward the behavior – behavioral beliefs and outcome evaluations

Experience and satisfaction toward the technology itself have emerged as some of the most significant factors explaining students' success in technology-based learning environments (Lee, Hong, & Ling, 2002). Students' attitudes affect their interaction and learning from technology-based instruction (Federico, 2000). TPB explains attitudes as individuals' beliefs about the consequences of performing the behavior (behavioral beliefs), and their evaluation of the consequences (outcome evaluations) (Ajzen, 1991, 2002a). Such beliefs and outcome evaluations are believed to have a direct effect on behavioral intention. Hence, students' beliefs about the consequences of using technology and their evaluation of those consequences are most likely to affect their activity in the technology-based learning environment.

2.2. Perceived behavioral control and efficacy beliefs

The concept of perceived behavioral control is by no means original to the TPB. Instead, it can be seen that perceived behavioral control is closely related to Bandura's (1982, 1997) concept of *self-efficacy* (Ajzen, 1991). Both are concerned with individual's perceived ability to perform certain behavior. Bandura (1982, 1997) defines perceived self-efficacy as personal judgments of one's capabilities to organize and execute certain courses of action. Self-efficacy involves judgments of capabilities to perform activities rather than personal qualities (Zimmerman, 1995, 2000). In this view, "efficacy beliefs operate as a key factor in a generative system of human competence" (Bandura, 1997, p. 37). Hence, different people with similar skills may perform poorly or excellently depending on variety in their beliefs of personal efficacy.

In educational contexts students' beliefs about their capabilities play an essential role in their motivation to achieve in a learning situation (Zimmerman, 2000). In general, people are not likely to perform behavior if they believe that they do not have abilities or opportunities to do so even if they hold positive attitudes toward the behavior. In TPB the perceived behavioral control can function as a connector for actual control and contribute to the prediction of behavior (Ajzen, 1991, 2002a), thus it could be hypothesized to be the most direct predictor of person's actions.

Moreover, efficacy beliefs are task-specific (Bandura, 2001) and there is no such thing as "general" self-efficacy. The concept of *computer self-efficacy* is suitable when dealing with a task that demands computer use. Computer self-efficacy refers to person's judgment of his or her capability to use a computer in prospective situations (Compeau & Higgins, 1995). It does not refer to simple skills, such as copying diskettes or writing e-mail. Instead, it includes judgments of the ability to apply those skills to broader tasks. There is often difference between possessing subskills and being able to integrate them into appropriate courses of action (Bandura, 1997). People often fail to perform optimally even though they know well what to do and they have requisite skills to do it. In addition, previous experiences with computers do not affect subsequent efforts to expand computer competencies; instead they affect only the perceived self-efficacy (Bandura, 1997).

3. Approaches to learning as a predictor of behavior and interpretations

Most technology-based learning environments are usually designed to support new styles of instruction and learning. They require students to be able to regulate, manage and take charge of their own learning. Furthermore, they usually demand skills for self-directed learning, information handling and collaborative building of knowledge. That is why students' appropriate learning and studying skills have emerged as important aspects of operating in such environments.

Entwistle, McCune, and Walker (2001), grounding their theory on studies conducted by Marton and Säljö (1976), have used terms *deep* and *surface approaches to learning* to describe students' everyday studying. Previous studies have indicated that students who adopt deep approaches to learning show a clear preference for an environment which is likely to promote understanding, while students who adopt a surface approach prefer situations which are thought to facilitate rote learning (Entwistle & Tait, 1990). Because many technology-based learning environments are designed to support collaborative knowledge building and promote students' deep understanding, it could be assumed that students who adopt deep approaches to learning manage better in such environments than students with less deep approaches. It has been reported (Wilson, 2000) that students who are successful in conventional learning situation are also successful with computer-mediated communication. It could be also hypothesized that students with deep approaches to learning are more satisfied with new, technologically rich learning environments. However, it is still not clear whether the same factors lead to academic success using technology-based learning as with traditional instruction (see Vauras, Salonen, Lehtinen, & Lepola, 2001).

4. Anxiety in computer using situations

Anxiety often occurs in response to environmental stimuli or situations (Eysenck, 1992). Most theories on anxiety have drawn a distinction between trait and state anxiety (Eysenck, 1992). Trait anxiety is a relatively stable personality dimension, whereas state anxiety is a situational, subjective emotional state (Eysenck, 1992; Spielberger, Gorsuch, & Lushene, 1970). Very high levels of state anxiety can cause impairment in virtually all aspects of performance (Eysenck, 1992). *Anxiety in computer using situations* is considered to be a specific example of state anxiety. In this study anxiety in computer using situation is defined as a subjective emotional state with perceived feelings of tension and apprehension (Spielberger et al., 1970) resulting from working with computers.

Even though nowadays technology is everywhere, the computers still seem to provide many opportunities to be perceived as threatening and to produce anxiety at least to some extent. Although most undergraduate students have some experiences with computers, not all students feel comfortable with studying and using computers. Besides, it is not clear whether the experiences with computers have only positive consequences and result in lower level of anxiety (Brosnan, 1998). Furthermore, anxiety often occurs in situations where one is learning something new, which causes resistance to change and has also negative effects on cognitive performance (Eysenck, 1992; Häkkinen, 1995).

Anxiety should be distinguished from negative attitudes towards computers. Computer attitudes have usually emphasized peoples' feelings about the impact of computers on their daily life and their understanding of computers. Anxiety involves more affective response, such as worries, apprehensions and tensions. Sometimes anxiety in computer using situation and technophobia are used as synonyms, but because the term phobia usually refers to a clinically diagnosed mental disorder (ICD-10, 1992), we would not use such term when describing relatively weak affective reactions resulting from computer using.

5. Students behavior in and interpretations of the learning environment

The aim of this study was to evaluate if the TPB (Ajzen, 1991, 2002a) explains students' activity in web-based learning environment. We hypothesized that positive attitude toward the behavior (behavioral beliefs and outcome evaluations) and high level of perceived behavior control (computer self-efficacy) would increase students' activity in the environment. Additionally, the scope was widened to students' approaches to learning and anxiety in computer using situations as well as the students' interpretations of the environment and the learning situation. This was done, because it has been shown (Entwistle & Tait, 1990) that approaches to learning are important factors that affect students' preference for certain kind of learning environment, and because we hypothesized that anxiety in computer using situations can impair performance in computer-based learning situation. We assessed if approaches to learning and anxiety in computer using situations affect the students' activity or their interpretations of the environment and the learning situation. Differences between two student groups from different university departments were also examined.

6. Method

6.1. Participants and learning environment

Data ($N = 42$) for this study were collected in autumn 2002 from undergraduate medical ($n = 21$) and sociology students ($n = 21$) who participated in courses organized through a web-based learning environment called WorkMates. WorkMates is a web-based collaborative learning environment developed in Educational Technology Unit in University of Turku Finland. The main focus in using WorkMates is supporting collaborative aspects of group work through the web in a time- and place-independent way. The user interface of the WorkMates environment is very simple and using it does not need any special computer using skills. That is why using WorkMates is easy even for users with only basic computer using skills.

The medicine course was intensive optional course on children's nutrition and lasted three weeks. The sociology course on research planning lasted for two months and it was compulsory for students. Students enrolled on the courses were contacted by a questionnaire before and after the courses. The response rate was 91% ($N = 42$) for the first measurement and 76% ($N = 35$) for the second measurement. Nine of the participants were men and 33 were women. Participants' ages ranged from 21 to 51 years ($M = 25$, SD $= 4.59$) and they had studied for two to seven years ($M = 4.7$, SD $= 1.13$). Almost all the participants (90%) had computers at home and half of them had an Internet connection. Third of the participants had used the WorkMates learning environment in their studies before the courses.

6.2. Measures and procedures

The participants answered a five-part questionnaire both at the beginning and end of the courses. At both times, beliefs, expectations and evaluations of using WorkMates learning environment in the course, computer self-efficacy, approaches to learning and anxiety in computer using situations were measured. In the pre-test, background information on experience with computers (scale ranging 0–10) and computer skills (scale ranging 4–10) was also gathered.

Attitude toward the behavior (behavioral beliefs and outcome evaluations) questionnaire was designed to obtain measures of the theoretical constructs described in the TPB (Ajzen, 1991, 2002b). *Interpretation* was assumed to form as a change of attitude toward the behavior during the courses. Participants were asked to answer 16 items assessing the evaluations of possible consequences of using the WorkMates learning environment (e.g. "Using WorkMates in this course will complicate studying"). These consequences were based on the salient beliefs concerning the use of web-based learning environment in studying.

In the first measurement behavioral beliefs associated with each of the possible outcomes were assessed by means of 11-point scale ranging from *unlikely* (0) to *likely* (10). These responses were averaged to form *probability score*. The same statements as in behavioral beliefs scale were also used as outcome evaluation statements with scale ranging from *unpleasant* (0) to *pleasant* (10). These responses were averaged to form *valence score*. In the second measurement participants answered to the same statements, but this time they were asked to evaluate, if the events described in the statements occurred during the course (0 = not at all, 10 = very clearly) and if they did, how pleasant they were (0 = unpleasant, 10 = pleasant). All the 16 items were grouped into seven negative ($M < 5.0$) and nine positive ($M > 5.0$) consequences according to participants' evaluation of their pleasantness in the first measurement.

Computer self-efficacy was measured using Computer Self-Efficacy Scale (Compeau & Higgins, 1995). Level, strength and generality (Bandura, 1997; Compeau & Higgins, 1995) of computer self-efficacy were measured in a scale with 10 items. Participants were asked to evaluate with scale ranging from *not at all confident* (0) to *totally confident* (10) how confident they felt about performing behaviors described in the questionnaire. Questionnaire items were task-specific, varied in difficulty and captured degrees of confidence (e.g. "I can get over with given assignment even if I have not used to program before" or "if I can get help when needed"). The scale demonstrated high internal consistency ($\alpha = .94$, $N = 41$). All the items correlated with the corrected total score, r:s ranging from .61 to .92 (all $p : \mathrm{s} < .05$).

A selected part of the Approaches and Study Skills Inventory for Students-questionnaire (Entwistle, Tait, & McCune, 2000) was used to measure participants' *approaches to learning*. The approaches to learning scale consisted of 18 items. *Deep approach* scale consisted of nine items, three from each subcategory such as Seeking meaning, Relating ideas and Use of evidence. Equally the *surface approach* scale consisted of three items of each categories such as Unrelated memorizing, Syllabus-boundness and Fear of failure. In both deep and surface approach scales participants were asked to rate with an 11-point scale ranging from *does not fit me at all* (0) to *does fit me very well* (10) how well the statements fit to themselves. In the present study ($N = 41$) the deep approach scale demonstrated moderate internal consistency ($\alpha = .84$). All the items correlated with the corrected total score, ranging from .47 to .77 (all $p : \mathrm{s} < .05$). The reliability of the surface approach scale was not acceptable ($\alpha = .52$) and the data from this scale were not analyzed.

Anxiety in computer using situations is usually measured through self-assessments with Likert-type scales. These scales typically contain positive and negative statements (e.g. "computers make me nervous" or "computers are fascinating") where respondents endorse a response from strongly agree to strongly disagree. Such scales cannot be considered very valid instruments for assessing state anxiety, if the content of the items covers concepts that are unrelated to anxiety-related feelings and physiological states. Instead of using these existing scales, a new scale for measuring computer-related state anxiety was constructed for the purpose of this study. In *Computer State Anxiety* scale participants were asked to rate with a scale ranging from *I would not feel at all* (0) to *I would feel very much* (10) how much they would experience anxiety-related feelings (Spielberger et al., 1970) in different kinds of computer-related situations (e.g. "I am writing an e-mail", "I am alone in a computer lab, and the computer crashes out", "I am searching information from www"). The preliminary scale consisted of 28 items.

A pilot testing for Computer State Anxiety scale ($N = 41$) was conducted in autumn 2002. In addition to answering the test items, participants were asked to rate how often they typically experience each incident described in the items. This was done in order to estimate the content validity of the scale. These responses were averaged to form an occurrence score. The final score on the scale was calculated by averaging participants' responses. Item-total score correlations were computed in order to remove inconsistently working items. Mean scores were computed for the frequency of experience-variables, and items with very rare and very common occurrences were dropped from the final scale. To test the content validity, test of normality was computed for the averaged occurrence scores. This revealed that the occurrences of items were normally distributed, and the scale could be considered valid from this point of view.

Eight items were dropped from the preliminary scale resulting in a final scale consisting of twenty items. In the pilot test the scale demonstrated high internal consistency ($\alpha = .92$). All the items correlated with the corrected total score, r : s ranging from .46 to .89 (all p : s $< .05$). In the present study ($N = 41$) the reliability of the Computer State Anxiety scale was also acceptably high ($\alpha = .92$). All the items correlated with the corrected total score, r:s ranging from .46 to .91 (all p : s $< .05$).

Activity in WorkMates environment was analyzed after the course. Analysis was based on participants' discussions of their exercises in the learning environment. Participants' comments in WorkMates environment form a threaded discussion. Participants could either start a new thread or comment existing threads. The comments were classified to six types in accordance of their content: proposing or suggesting, supporting or agreeing, opposing or disagreeing, information giving, questioning and answering or specifying. One comment could include several types of content. Content classes used in the classification were developed on the basis of contents of the discussions. Two researchers analyzed discussions in order to ensure the relevance of the categories.

7. Results

Most of the participants rated themselves as skilled computer users ($M = 8.1$, MD $= 8.0$, SD $= .76$), and they also spent lots of time with computers both at studying purposes ($M = 7.3$, MD $= 8$, SD $= 1.8$) and at free time ($M = 7.0$, MD $= 8$, SD $= 1.9$). As normality could not be assumed in some of the tested distributions, a nonparametric approach with exact distributions was used in all. Differences between groups were tested with Mann-Whitney-Wilcoxon test. No significant differences were found between medical and sociology students' anxiety and deep approaches to learning. Mean anxiety in computer using situations was quite low ($M = 1.8$, MD $= 1.4$, SD $= 1.30$) in all participants. Additionally, participants had adopted moderately deep approaches to learning ($M = 6.6$, MD $= 6.6$, SD $= 1.46$). On the other hand, there were significant differences ($U = 110.5$, $p < .01$) in computer self-efficacy between medical and sociology students. Medical students' computer self-efficacy ($M = 8.5$, MD $= 9.2$, SD $= 1.85$) was higher than sociology students' efficacy ($M = 7.6$, MD $= 7.8$, SD $= 1.24$).

Changes in self-efficacy, deep approaches to learning and anxiety were tested with Wilcoxon's signed ranks test. Self-efficacy and deep approaches to learning did not change during the courses in either group. Medical student's anxiety did not change during the course, but sociology students' anxiety was significantly higher at the end of the course ($Z = -2.25$, $p < .05$).

7.1. Association of self-efficacy, deep approaches to learning and anxiety

When the groups were combined, pre- and post-test scores of self-efficacy were correlated ($r_s = .71$, $p < .01$, $N = 34$), as well as pre- and post-test scores of anxiety in computer using situations ($r_s = .86$, $p < .01$, $N = 33$) and pre- and post-test scores of deep approaches to learning ($r_s = .83$, $p < .01$, $N = 33$). Anxiety was correlated with self-efficacy in both pre- ($r_s = -.39$, $p = .01$, $N = 41$) and post-tests ($r_s = -.67$, $p < .01$, $N = 33$). This pattern corresponded with our assumptions. Deep approaches to learning were not correlated with any of the other pre-test measures, but the post-test score of deep approach was correlated with post-test score of self-efficacy ($r_s = .55$, $p < .01$, $N = 33$) and anxiety ($r_s = -.41$, $p = .01$, $N = 33$). Participants' previous experience with computers was not correlated with either anxiety or computer self-efficacy. Instead participants' self-evaluation of their own computer using skills was correlated with computer self-efficacy ($r_s = .49$, $p < .01$, $N = 41$).

7.2. Predicting activity in the environment

Using total number of participants' comments in WorkMates environment as an indicator of activity might not be plausible, because in such approach the content of the comments is ignored. That is why we formed total activity score by multiplying total number of comments with total number of contents in the comments. A natural logarithm was taken from the score to balance the skewness of the distribution. There were no differences between medical and sociology students' activity, and because the sample size was small the data were collapsed over groups.

In order to predict the activity in the learning environment, binary logistic regression model was constructed with dichotomized total activity score as dependent variable and pre-test of positive and negative behavioral beliefs and outcome evaluations, self-efficacy, deep approaches to learning and anxiety in computer using situations as predictors. The accuracy of prediction was low (62.90%) and the model was not significantly better than the model including only a constant ($c_2 = 4.13$, df $= 7$, $p > .05$, Nagelkerke $R^2 = .15$). Additionally, none of the predictors were statistically significant. Therefore the model was considered to be inappropriate.

7.3. Students' interpretations – behavioral beliefs and outcome evaluations

There were no significant differences in pre-test scores of behavioral beliefs and outcome evaluations between medical and sociology students. Instead, the differences between student groups in post-test scores of experienced probability of negative events ($U = 30.5$, $p < .01$) and experienced valence of negative ($U = 59.00$, $p < .05$) and positive ($U = 58.00$, $p < .05$) events were significant. That is why medical and sociology students' behavioral beliefs and outcome evaluations are considered also separately.

Participants' interpretations of the learning environment (see Table 1) were assessed by testing the change in behavioral beliefs, i.e. the experienced probability of positive and negative consequences, as well as the change in outcome evaluations, i.e.

Table 1
Mean probabilities and valences of consequences

Using WorkMates in this course will...	Probability				Valence			
	Pre-test		Post-test		Pre-test		Post-test	
	M	SD	*M*	SD	*M*	SD	*M*	SD
Diversify way of working (+)	7.2	1.8	6.6	2.2	7.8	1.2	7.6	1.2
Reduce face-to-face instruction (−)	7.2	2.3	7.6	2.4	4.7	2.1	5.0	2.6
Require many computing skills (−)	3.7	1.7	2.8	2.0	4.8	2.4	6.0	2.1
Create new way of working (+)	6.1	2.4	5.3	2.8	7.6	1.4	7.2	1.5
Ease information acquiring (+)	5.8	2.2	6.3	2.2	8.3	1.6	7.6	1.4
Develop diverse interaction skills (+)	4.9	2.3	4.8	2.2	7.9	1.6	7.0	1.6
Complicate studying (−)	4.1	2.4	3.5	3.0	2.5	1.8	3.6	2.0
Give new opportunities for problem solving (+)	6.8	1.7	5.9	2.4	8.0	1.7	7.3	1.4
Increase amount of work (−)	5.5	2.3	4.7	3.0	2.5	1.8	3.9	2.4
Develop diverse information handling skills (+)	6.6	1.7	4.9	2.5	8.2	1.2	7.2	1.2
Take a lot of time (−)	5.7	2.4	5.0	3.2	2.4	1.7	3.7	2.1
Impair the science of the material (−)	2.7	1.9	2.6	2.1	2.7	2.2	4.0	1.7
Develop diverse cooperation skills (+)	5.2	2.2	4.4	2.0	7.9	1.6	6.9	1.6
Reduce social contacts with other students and teacher (−)	5.2	2.5	5.9	2.8	2.8	1.6	3.9	2.4
Increase amount of information (+)	6.1	2.1	6.3	2.3	7.3	2.1	7.3	1.8
Ease communication between students and teacher (+)	6.7	1.8	6.3	2.1	8.1	1.5	6.9	2.1

the experienced valence of possible positive and negative consequences. The differences were tested with Wilcoxon's signed ranks test with exact distributions. Participants' experienced probability of negative events did not change, but their experienced probability ($Z = -2.53$, $p < .01$) and valence of positive events ($Z = -3.12$, $p < .01$) decreased and experienced valence of negative events ($Z = -3.12$, $p < .01$) increased during the course (see Table 2).

Medical students' experienced probability and valence of negative events did not change significantly, but their experienced probability ($Z = -2.40$, $p = .01$) and valence of positive events ($Z = -2.67$, $p < .01$) decreased during the course. Instead, in sociology course students' experienced probability and valence of positive events did not change, but their experienced probability of negative events ($Z = -2.35$,

Table 2
Differences between pre- and post-test measures of consequences

	Pre-test		Post-test	
	M	SD	*M*	SD
Probability of positive events	6.2	1.3	5.7	1.5
Probability of negative events	4.8	1.4	4.6	1.6
Valence of positive events	8.0	1.1	7.1	1.3
Valence of negative events	3.2	1.4	4.3	1.6

$p = .01$) decreased and valence of negative events ($Z = -3.02$, $p < .01$) increased during the course.

Associations of self-efficacy, deep approaches to learning and anxiety with experienced probability and valence were also examined. Pre-test of participants' anxiety was positively correlated with the pre-test of the experienced probability of negative events ($r_s = .41$, $p < .01$, $n = 41$) and negatively correlated with valence of negative events ($r_s = -.35$, $p < .05$, $n = 40$). Participants with more anxiety in computer using situations expected more negative events and consider the events less favorable than participants with less anxiety. Association between anxiety and post-test of probability and valence of events was not found. Additionally, participants' deep approaches to learning and post-test of probability of negative events were negatively correlated ($r_s = -.47$, $p < .01$, $n = 30$). Participants who had adopted deep approaches to learning experienced less negative events in course than participants who adopted less deep approaches. There was no association between self-efficacy and probability and valence of events. Moreover, there were no significant differences on pre- and post-test of probability and valence of events between participants that had or had not used the WorkMates learning environment earlier in their studies.

8. Discussion

Our data did not support the hypothesis that the TPB could be used to explain students' behavior in the WorkMates learning environment. Participants' attitude toward the behavior and efficacy beliefs did not predict their activity in the WorkMates learning environment. Neither deep approaches to learning nor anxiety did predict the activity in the environment. This is promising, as this suggests that people can take advantage of such environments regardless of their experiences with computers and the environment or learning approaches. These result do not support the previous assumption that students' use of the technology may be limited by their negative attitudes toward the instruction that is not consistent with their past experience (Åkerlind & Trevitt, 1999; Shaw & Marlow, 1999) or toward the technology (Federico, 2000; Lee et al., 2002).

However, participants interpreted the learning environment more negatively after the course, which may make them less eager to participate in similar courses in the future. They had quite positive expectations about the using WorkMates environment in the course, but the course or the environment did not correspond to their expectations. Despite of that, participants still experienced the negative events to be more pleasant than they expected them to be before the course. This might indicate that experiences were not oriented only negatively.

There were also differences between student groups. Medical students interpreted the learning environment more negatively after the course. The same phenomenon was observed when the data were collapsed. Sociology students interpreted the environment and the learning situation somewhat more positively after the course. Their expectations were quite similar to medical students before the course, but sociology students did not experience as much as negative events after the course than they had expected. Sociology students also experienced the negative events to be more pleasant after the course.

However, the fact that medical students interpreted the environment and the learning situation more negatively and sociology students more positively after the courses cannot be taken to imply that medical students are more dissatisfied with technology than sociology students. The results might be due to the difference in duration and optionality of the courses, but also due the differences in approaches to teaching and the teachers' experience about using the WorkMates environment. Problem-based learning method was used in the medical course. Two case-based exercises every week were meant to stimulate students' self-directed learning and discussions in the learning group. Students on the sociology course also worked collaboratively, and the discussions of students' research plans were based on peer tutoring, but there were not any explicit exercises or intensive schedule as in medical course. Additionally, a teacher who did not have earlier experience about WorkMates arranged the medical course, whereas the teachers on the sociology course were experienced users of WorkMates. This may also have had an effect on course arrangements and achievement.

Although the hypothesis that approaches to learning could predict the participants' activity was not supported, it was found that participants with more deep approaches to learning were more satisfied with the WorkMates environment and the learning situation after the courses. Such result is consistent with the idea that approaches to learning could be important factor that affect students' preference for certain kind of learning environments (Entwistle & Tait, 1990). Additionally, participants' anxiety in computer using situation was associated with their negative expectations of the consequences of using technology-based learning environment in their studies. This may make anxious students less eager to participate for example voluntary courses that are organized trough technology. Fortunately, anxiety was not associated with experiences after the course.

All the participants had fairly high levels of computer self-efficacy, and the average level of anxiety among them was quite low. It can be argued that anxiety in computer using situations is a vanishing phenomenon especially in universities, because nowadays almost everybody has some experience with computers when they starts their studies. Experience does not, however, always have only positive consequences and result in lower anxiety. As Brosnan (1998) points out, the fact that some studies have identified a relationship with greater prior experience and lower anxiety cannot be taken to imply that greater experience results in reduced level of anxiety. This was also observed in this study, as anxiety was not related to participants' previous experience with computers. On the contrary, sociology students' anxiety actually increased during the course.

Furthermore, as discussed earlier, anxiety usually occurs in situations where one is learning something new (Häkkinen, 1995). Technology is developing constantly. There is a strong possibility that there will always be some new innovations, new trends and new methods for using technology in education. Thus, if students have to learn something new every once in a while, some form of anxiety can also be expected. This also implies that the scales used to measure technology-related anxiety should be constantly revised.

Some limitations in these results should be mentioned. Firstly, the psychometric properties of the approaches to learning-scale were not satisfactory. This is partly due to the length of the scale, because we had to limit the number of the items in order to keep the questionnaire comfortably short. On the other hand, such scale measuring general approaches to learning might not be appropriate if the learning process is very situation-specific. Instead, a scale measuring situation-specific approaches to learning might be more suitable. For another, the sample was quite small due to the small number of participants in both courses and consisted only of medical and sociology students, and similar pattern of responses might not emerge on other student samples. Due to that, all the results should be interpreted with caution.

9. Conclusions

New methods of instruction are constantly developed, and nowadays university students have to adapt to many different methods of learning. Students differ with regard to their ability to adapt into learning environments. They also interpret the learning environment and the learning situation differently according to their individual differences. That is why it is important to study the factors that mediate the process of adaptation and interpretation. The theory of planned behavior suggests some explaining factors that could not, however, be found to be significant in this study. However, one component of the theory, the subjective norms (Ajzen, 1991, 2002a), was not assessed in this study. As many new methods of learning – such as problem-based learning in a web-environment – are collaborative processes, we would hypothesize that certain attributes of the learning group might be more important factors in explaining students' behavior in such environments. In addition to the subjective norms (Ajzen, 1991, 2002a), these could be the learning culture of the student group and their collective sense of efficacy (Bandura, 1997). That is why future research should also be focused on the characteristics of the learning group as well as the characteristics of the individual students.

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