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An Examination of Computer Engineering Students' Perceptions about Asynchronous Discussion Forums

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This study was conducted in order to reveal the usage profiles and perceptions of Asynchronous Discussion Forums (ADFs) of 126 computer engineering students from the Computer Engineering Department in a university in Turkey. By using a mixed methods research design both quantitative and qualitative data were collected and analyzed. Research findings indicated that the ADFs were frequently and effectively used by computer engineering students as a learning instrument. Another finding was that discussions in the ADFs were in the form of question-answer and resulted in important learning outcomes especially in eliminating the problems encountered by the students.

Keywords: Computer-mediated communication, cooperative/collaborative learning, learning communities, engineering education

INTRODUCTION

The development of information technologies introduced important innovations and changes to the field of education as well as to many other fields. As a result, educational activities have gone beyond the realms of traditional classroom environments, with students becoming involved in frequent use of the internet. Nowadays, web 2.0 tools such as blogs, wikis, social networking sites and Asynchronous Discussion Forums (ADFs) are being widely used as online learning environments (An, Shin, & Lim, 2009; Koh, Herring, & Hew, 2010; Olofsson, 2007). Of these networking technologies, ADFs, which are based on discussions of individuals with each other, are considered important information sources (Andresen, 2009; Hew, & Cheung, 2008). By means of the ADFs, which are also accepted as Computer Mediated Communication (CMC) tools, individuals discuss with each other on various topics and exchange opinions thereby contributing to the

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emergence of knowledge (Amhag, & Jakobssona, 2009). Thanks to information networking performed in this way as well as online learning activities, the ADFs are being turned into social support networks (Chen, & Chiu, 2008; Hou, Chang, & Sung, 2008; Lo, 2009). These support networks produce online learning communities. When students need any kind of information, they participate in these network forums, ask their questions, respond topics initiated by others, and become a part of the social communication network (Andresen, 2009; Hrastinski, 2008). In the context of education, it has been emphasized that peer discussion facilitates learning (Hew, & Cheung, 2008; Liu, & Tsai, 2008; Patriarcheasa, & Xenos, 2009). The ADFs serve as good examples of Computer-Supported Collaborative Learning (CSCL) environments, mainly due to their structure. For the past decade, theories of CSCL, with an emphasis on the importance of the social context of learning, have been relatively well-developed areas of research. For example, Garrison, Anderson and Archer (2001) and Meyer (2003) use the contributions of course participants in these communication networks to categorize the development of their ability to analyze critically. La Pointe and Gunawarndena (2004) also indicated that student-student interactions have a higher

State of the literature

- Asynchronous Discussion Forums (ADFs) are social support network environments frequently used by individuals for information sharing and constructing their own knowledge.
- Dialogues that are conducted in the ADFs play an important role in making individuals construct their own knowledge and learn by themselves.
- There are many studies in the literature focusing on the effect of ADFs on students' cognitive and social development and construction of knowledge in different fields.
- There are few studies focusing on the effects of the ADFs on students' cognitive development and construction of knowledge in the context of engineering education.

Contribution of this paper to the literature

- This study was conducted in order to examine the perceptions of computer engineering students relating to asynchronous discussions.
- Findings of the study reveal that ADFs are frequently used by computer engineering students.
- According to the results of the study, ADFs are important learning environments in terms of sharing information and creating social support networks
- Discussions, which are mainly question-answer dialogues that are intended to eliminate errors, produce important learning outputs in engineering education.

impact on students' learning outcomes than mere student-instructor interactions do.

Participation in discussions occurring in the ADFs is entirely voluntary. Thus, the use of ADFs by individuals and their utilization profiles vary from one to another. Hranstanski (2008) evaluated the participation of individuals in the ADFs in under the following six categories: (1) *participation as accessing e-learning environments*, (2) *participation as writing*, (3) *participation as quality writing*, (4) *participation as writing and reading*, (5) *participation as actual and perceived writing*, and (6) *participation as taking part and joining in a dialogue*. These participation categories can be grouped either active participation or passive participation. Those individuals who connect to the ADFs by both writing and participating in dialogues are considered active participants (Hranstanski, 2008), while those who benefit from such discussion forums by reading alone are named as passive participants (Hranstanski, 2008). However, there are some studies, for example by Jakobsson (2006), that indicate that student participation

in these discussions is not always active in such knowledge-building communities. Individuals who participate actively in the ADFs play a direct role in constituting knowledge. As for the passive participants, while they do not have any role in constituting knowledge, they benefit from the knowledge pool that has been developed through discussions conducted in those environments. The dialogues that are made in the ADFs play an important role in making individuals construct their own knowledge and learn by themselves (Chen, & Chiu, 2008). Individuals constructing their own knowledge in this way affect not only their cognitive development but also their social development. Therefore, learning outputs emerging from the discussions that are conducted in the ADFs have features that support the social aspect of learning that are emphasized by Vygotsky (1978) and Wenger (1998).

The perceptions of students about the discussions that are conducted in the ADFs are important, too. Various studies using a variety of techniques, have been conducted in order evaluate students' perceptions towards the discussions and learning activities conducted in such environments. Bullen (1998) and Olofsson (2007) focused on the manner of and the reason for student participation in educational online learning environments. Ellis (2003) requested students to write reflective reports concerning their experience in online forums. Hrastinski (2006) employed closed-ended questions, for example, to map the social networks of students in an attempt to understand how students participated in communities. In addition, Kuboni and Martin (2004) included an open-ended question as a complement to closed items in a questionnaire. In general, studies reveal that students displayed positive attitudes towards these networking environments and they use these environments as learning instruments.

Turkish Context

It is possible to say that there is limited number of studies in the literature regarding the regarding the use ADFs in Turkey. Özçınar and Öztürk (2008) examined elements preventing or facilitating online discussions in their studies along with student views of the use of ADFs among 15 college students. Based on qualitative data analysis, the student views indicated that there was consensus over certain issues such as the necessity for forum administrators to participate in discussions, as well as various views regarding group size.

Özyurt, and Özyurt (2010) examined learning activities in relation to learning English in web-based environments including in ADFs. The document analysis method was employed in the study to examine all asynchronous discussion environments in Turkey

concerning English teaching and learning including analysis of the contents of these environments. The study involved interviewing five high school students. The results of these analyses showed that these environments were especially used as informal learning environments and they had a positive effect on the English training of individuals who used these environments. Özyurt, and Özyurt (2011) investigated the mathematics learning activities that took place in ADFs among 86 high school and college students. The study tried to reveal preferences, user profiles and individual ways of using these environments. According to the research results, ADFs are one of the computer-assisted collaborative learning tools that are commonly and effectively employed in the context of mathematics learning.

Topcu (2006) focused on the gender difference in an online asynchronous discussion involving 30 mathematics teacher candidates that was considered to be an essential component of a face-to-face undergraduate course. According to the results of the study, there was no effect of gender on online asynchronous discussion performances in the analysis after controlling the previous achievement and web experiences of teacher candidates. Topcu and Ubuz (2008) studied the effect of Metacognitive Knowledge (MK) of 32 teacher candidates on their participation in online discussion forums. According to the relationship between the discussion scores and the MK level as demonstrated by the research results, MK had a predictive value in the quality of the teacher candidates' participation in the asynchronous online discussion. Yıldırım (2010) analyzed the factors influencing student participation in a discussion forum for two primary purposes. His first purpose was the examination of the relationship between the students' individual demographics and the categories of students' participation levels (inactive, moderate, and active) in the discussion forum of an online course. Secondly, his study aimed at examining the opinions of students concerning the reasons for their low level of interaction in the discussion forum. The research sample consisted of 196 students attending the computers systems and structures course of this online certificate program. The results of the study showed that those students who were successful in the online course were mostly active participants in the discussion forum. The present study also evidenced the existence of a significant difference by gender between the expected and actual number of inactive, moderate and active students in the discussion forum.

Purpose of the Study

While there is a wide range of studies in the literature related to the examination of the effects of the ADFs on cognitive and social skills of students and their knowledge construction, there is a lack of studies that examine this subject in the context of engineering education. This study was conducted in order to examine the perceptions of computer engineering students relating to asynchronous discussions. Therefore, we set out to determine the usage levels and profiles of computer engineering students using these forums. In this study, an attempt was made to answer the following questions:

- *What are the perceptions of computer engineering students relating to asynchronous discussion forums?*
- *What are the usage levels and profiles of computer engineering students using asynchronous discussion forums?*
- *What are the opinions and attitudes of computer engineering towards the discussions that are conducted in asynchronous discussion forums?*

METHOD

Research Design and Sample

A mixed methods design was employed in the study. Quantitative and qualitative data were obtained from 126 computer engineering students from a university in Turkey. The students making up the research sample were chosen randomly from among the students in that department. The normal study period in the computer engineering department is 4 years. Thus, those took more than 4 years to complete their studies were denoted as being in grade 5+. The distribution of the students who were involved in the study based on grades is as follows: grade 1 [n = 29 (23%)], grade 2 [(n = 37 (29.4%)], grade 3: (n = 26 (20.6%)], grade 4 (n = 23 (18.3%)], and grade 5+ [(n = 11 (8.7%)]. The distribution of students based on gender was as follows: male [(n = 81 (64.3%)], and female [(n = 45 (35.7%)].

Data Collection Tool

A questionnaire consisting of 10 questions that was used in order to elucidate students' opinions related to discussions in forums and to determine the perceptions of students about asynchronous discussion was developed by the researchers based on the related literature prior to commencement of the study. This questionnaire was submitted for evaluation by three experts from the department of Turkish teaching and the faculty of education of the same university for content validation. The experts evaluated the questionnaire in terms of meaning and readability. The final version of the questionnaire incorporated the opinions of these experts. The Cronbach's alpha reliability coefficient was found to be 0.87. The first nine questions of the questionnaire were used for

obtaining quantitative data while the last question was for obtaining qualitative data.

Data Analysis

The quantitative and qualitative data obtained from the study were subjected to data analysis. The frequency distribution of each item was calculated in the analysis of the quantitative data. By means of the analyses of these data, the attitudes of the computer engineering students towards ADFs and their usage profiles were identified. Students were encoded as *Stu1, Stu2,…,Stu126*. The qualitative data obtained from the students responses were analyzed using the content analysis method. Content analysis was performed by the two researchers and a doctoral student studying at the department of computer and instructional technology of the same university. Then, the coding assigned by three researchers as well as the themes formed in accordance with such coding processes were examined collectively. Several common themes were obtained at the end of this examination.

FINDINGS

Table 1 contains the items in the questionnaire, and the frequency distributions of the responses given by the students.

According to Table 1, 64.3% of the participants were male while the remaining 35.7% were female. All the students who responded to the questionnaire had membership in one or more forums. According to the responses given, 81.7% of the participants had more than one membership. Based on the frequency of using the forums, it was ascertained that most of the students who participated in the questionnaire used forums often. The number of students who used the forums almost every day made up 75.4% of the students who participated in the study. Regarding the reasons for using the forums, 61.1% of students stated that they used the forums for troubleshooting and error elimination. Similarly, when participation styles of individuals in the forums were examined, 73.0% of students stated that they used the forums actively while 27.0% of them stated that they use them passively. Similarly, when the frequency distribution of the responses of each item was examined, it emerged that students gave considerably positive statements about many parameters such as considering information networking in forums to be beneficial and utilizing the information that was retrieved for real life purposes. When the responses to the item relating to the necessity of forums were examined, it emerged that only 7.1% of the participants considered forums to be unnecessary.

The analysis of the qualitative data obtained through the last item of the questionnaire clearly demonstrated how students perceived the learning environments of the forums. Within this context, the main themes of *social learning environment* and *content* were obtained as a result of the qualitative data analysis. These themes, their sub-themes, and students' opinions concerning the themes are presented below:

Social Learning Environment: Students stated opinions indicating that ADFs provided good information sharing environments, are helpful especially in troubleshooting, help to maintain permanent learning, and enable a person to acquire different perspectives in troubleshooting. Sub-themes that were extracted from these themes are: *information sharing, providing different perspectives, troubleshooting,* and *permanent learning.* Samples of student opinions relating to this main theme and sub-themes are as given below:

Stu3: "…*Forums are helpful mostly for troubleshooting and gaining practical knowledge. It is good to benefit from the experiences and knowledge of different people…*"

Stu25: "…*Since each issue, which has been commented on, is being observed and followed by many people, different interpretations and preferences emerge. This provides us with different perspectives towards the events…*"

Stu43: "…*In addition, since the individuals who use these environments try to obtain the information they want out of their own eagerness (that is without an outward necessity as when in school), the knowledge becomes permanent. I cannot forget anything which I attained in this way and the accuracy of which I feel confident. …*"

Stu87: "….*Forums are beneficial in terms of finding solutions to the encountered problems…*"

Stu93: "…*Today, I find forums and similar networking environments as beneficial in terms of acquiring knowledge and troubleshooting… I participate in discussions in order to share my knowledge with others and overcome the problems I encounter…*"

Stu121: "…*Forums which I use in order to acquire information about the solution of any problem I encounter may be rather beneficial since at least one or two people in the forum encountered the same problem and somehow managed to overcome it…*"

Content: Students evaluated the ADFs in terms of content and expressed their ideas about them. Students expressed that most of the information in the ADFs is reliable. To ensure reliability of the information, these environments should be checked in terms of content as there are discrepancies in the information in these environments, and their content should be verified ad updated. The sub-themes obtained from this theme can be listed as follows: *instantly reaching information, checking content, inaccuracy of information, waste of time, updated content, simplified content, being inadequate in teaching new subjects.* Samples from student opinions relating this theme and sub-themes are as follows:

Stu6: "…*It conveys the information to users accurately in a short period of time…*"

Table 1. The questionnaire that was administered to students and the frequency of distribution of answers (N = 126)

Items	Responses			
The number of the forums in which you have membership	0	1	More	
	0 (0.0%)	23 (18.3%)	103 (81.7%)	
Frequency of forum usage	Seldom	two-three times a month	two-three times a week	almost everyday
	9 (7.1%)	7 (5.6%)	15 (11.9%)	95 (75.4%)
Purposes of using forums	resource sharing	troubleshooting – error elimination	research for lessons	studying the topics which raise curiosity
	6, (4.8%)	77, (61.1%)	5, (4.0%)	38, (30.1%)
Participation style in forums	active participation	passive participation		
	92, (73.0%)	34, (27.0%)		
The rate of obtaining the information you searched for and accuracy level of the information	High	medium	Low	
	79, (62.7%)	32, (25.4%)	15, (11.9%)	
Usability level of the information you obtained from forums in real life and for solving problems	Highly beneficial	Beneficial	Not beneficial	
	83, (65.9%)	43, (34.1%)	0, (0.0%9	
Considering the communication, interaction and exchange of information between individuals in forums as beneficial	High	Medium	Low	
	76, (60.3%)	37, (29.4%)	13, (10.3%)	
Necessity of Forums	Highly necessary	Necessary	Unnecessary	
	74, (58.7%)	43, (34.2%)	9, (7.1%)	
Qualitative data	Taking into account your forum utilization and acquisition of knowledge from forums, what do you think about the learning activities occurring in these environments and the effect of these environments on your learning? Could you evaluate these environments?			

Stu25: "…*Forums should have a quality check mechanism. Maybe, registration to these forums should require obtaining official permission. Forum signature may be kept for credibility. There are lots of forums and they are increasing day by day. Which one of them is credible, which one of them contains better resources... Maybe there should be a search optimization…*"

Stu56: "… *There is lots of information, and it takes a long time to decide and confirm which one is accurate. If generated forums are organized by people who are interested in the relevant field, reaching beneficial and accurate information may take a shorter period of time, and discrepancies in the information and waste of time could be prevented…*"

Stu87: "…*in order to answer a question, futile and irrelevant things are written. Therefore, approximately 80% of forums are inaccurate…*"

Stu98: "…*The biggest problem of forums is that most of the time it takes a long time to find the forum which has the best content or which will enable you to find the information you are searching for. There are many forums in virtual environment and most of these have limited content or are full*

of unnecessary discussions. In this regard forum administrators should work more painstakingly on this issue from …"

Stu102: "…*Forums cannot be very beneficial in terms of teaching new topics…*"

Stu117: "…*Forums are really beneficial in eliminating the problems encountered in daily life, however, I do not think they have any additional benefit …*"

DISCUSSION

This study was conducted in order to identify the effect of discussions conducted in the ADFs on computer engineering students' comprehension and learning of the topics related to computers. An attempt was made to reveal the ADF usage profiles and opinions related to the discussions conducted in these environments.

According to the quantitative data obtained from the participants, the ADFs are frequently used by students. When frequency distributions of the responses given by

participants to the questions in the questionnaire are examined, it is seen that most of the students use these environments as learning environments and they have positive attitudes towards them. These expressions are directly in parallel with the view in the literature that ADFs are being used as learning environments (Koh, Herring, & Hew, 2010; Olofsson, 2007). Students' answers concerning the purpose of forum usage are remarkable. Most of the participants (61.1%) stated that they used these environments for troubleshooting and eliminating errors. This clearly reveals the purpose of ADF usage. As a matter of the fact, when sub-themes related to the themes obtained as a result of qualitative data analysis are examined, the findings supporting this idea are evident. From this perspective, the discussions conducted in the ADFs are considered to be really beneficial for troubleshooting and error elimination. Based on the frequency distribution of the answers given by participants to other questions in the questionnaire, it is possible to say that students have positive attitudes towards the discussions conducted in the ADFs and the social networking and learning outputs obtained through these discussions. These findings support the findings of the studies in the literature (Bullen, 1998; Ellis, 2003; Hrastinski, 2006; Kuboni, & Martin, 2004; Olofsson, 2007) suggesting that participants display positive attitudes towards the ADFs and learning outputs in these environments.

When the findings are evaluated within the frame of the themes extracted as a result of the qualitative data analysis, students' attitudes towards the ADFs and their opinions relating the discussions in these environments become obvious. Initially, the themes obtained through qualitative data analysis generally support the findings obtained from quantitative data analysis. In addition, the basic themes that emerged as result of the qualitative data analysis were *social learning environment* and *content*. When the sub-themes in relation to the *social learning environment* theme are examined, it is seen that all sub-themes contain positive opinions. Information sharing, troubleshooting and permanent learning have come to the forefront among these sub-themes. These opinions of students show parallels with the studies in the literature which argue that ADFs are important social support networks and play an important role in individual construction of knowledge of individuals (Hew, & Cheung, 2008).

When the sub-themes and participants' opinions relating to the *content* theme are evaluated, the sub-themes can be classified as being positive or negative. Most of the sub-themes under the *social learning environment* theme are seen to be negative. As a matter of fact, participants emphasized that one may come across many unnecessary dialogues in forums: there is inaccuracy of information and forum contents should be purged of these discrepancies, and the contents should be updated. The inadequacy of forums in terms of teaching new topics is one of the first criticisms concerning the content. As a matter of fact, when themes extracted from participant opinions are taken into consideration, students seem to think that discussions in forums are beneficial in terms of troubleshooting and problem solving, however, they do not serve the purpose of teaching new topics. This is in parallel with most of the quantitative data obtained from the questions investigating the participation purposes of individuals. As a matter of fact, most of the individuals who participated in forums (61.1%) stated that they used those environments for troubleshooting and error elimination. This indicates that discussions in forums are used mainly for troubleshooting.

Students considered the ADFs beneficial in terms of solving problems and eliminating errors; however, they found them to be inadequate in teaching new topics. The main reason for this opinion could be the fact that discussions in the ADFs are rather question-answer dialogues devoted mainly to eliminating errors. It can be deduced from the findings of the study that discussions in forums have an important place in terms of constructing and using students' knowledge and troubleshooting and problem solving in particular. According to the findings relating second research question, the majority of the participants actively participate in discussions in the ADFs and helped in the construction of knowledge. On the other hand, some participants were passively involved in the discussions. Participants generally mentioned the necessity of discussions in the ADFs, and the fact that such environments produced important learning outputs. Participants' views also implied that discussions in the ADFs have an important place in individual constructing of knowledge, and discussions in these environments yield important learning outputs. Findings relating the third research question of the study, indicate that students generally had positive opinions towards the learning activities that occurred in these environments; however, they expressed generally negative opinions related to the content.

CONCLUSION

This study aimed at revealing the opinions of computer engineering students concerning the use of ADFs and learning activities that take place in such environments in relation to learning and comprehending computer-related concepts. The study was conducted with 126 participants from the department of computer engineering of a university in Turkey. A mixed methods design was employed in the study. Quantitative and qualitative data were obtained from participants. These data was analysed to address three research questions.

Findings of the study revealed that the ADFs are frequently used by computer engineering students. Students can share information and exchange opinions using these environments. According to the results of the study, ADFs are important learning environments for sharing information and creating social support networks. In order to make the discussions in these environments more beneficial and enable individuals to better acquire knowledge from these environments, forum administrators and people who are interested in relevant topics should follow these environments and organize the contents. Within this context, intervention of site administrators and the simplification of relevant contents may be an effective method for facilitating access to the information that is searched.

In conclusion, computer engineering students frequently and commonly use the ADFs as learning environments. Discussions, that are mainly question-answer dialogues intended to eliminate errors, produce important learning outputs. Students either directly participate in the discussions of these environments or construct and use their knowledge utilizing previously documented discussions. This kind of learning becomes permanent and results in acquisition of beneficial information.

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