CONSTRUCTING KNOWLEDGE: AN EXPERIENCE OF ACTIVE AND COLLABORATIVE LEARNING IN ICT CLASSROOMS

Margarida M. Pinheiro
Higher Institute of Accountability and Administration
Research Unit for Governance, Competitiveness and Public Policies
University of Aveiro
Portugal
margarida.pinheiro@ua.pt

Dora Simões
Higher Institute of Accountability and Administration
Research Unit for Governance, Competitiveness and Public Policies
University of Aveiro
Portugal
dora.simoes@ua.pt

ABSTRACT
This paper reports on the impact of the implementation of active and collaborative practices in ICT (information and communication technologies) classrooms. Both of these approaches convey a lot of responsibility from the teacher to the students and the hoping, as backed up by the literature, is to promote deeper learning and reasoning skills at a higher level. The question is: how do you do all that? This research describes a specific environment that makes use of collaborative tools, like wikis and forums within an e-learning platform and of specific CRM (customer relationship management) software. In order to analyze how this learning environment gets learners actively involved in learning and working together in productive ways, students were surveyed by responding to questionnaires. Several cause-effect relations underlying the teaching-learning methodology and the students' performance are discussed.

1. INTRODUCTION
Active and collaborative learning are well known as alternative strategies to conventional teaching models (e.g. Kaufman, Sutow & Dunn, 1997; Prince, 2004). In particular, active and collaborative practices in ICT (information and communication technologies) classrooms are an emerging branch of the learning sciences concerned with studying how people can learn together with the help of computers. The pedagogical and socio-economic forces that have driven the higher learning institutions to adopt and incorporate ICT in teaching and learning are already changing the organization and delivery of higher education (Sife, Lwoga & Sanga, 2007). However, like Silva *et al*. (2002) say, there is still much to be done within the culture of the universities, to overcome the individualistic matrix to a culture of collaborative learning.

In the present study we highlight a specific environment that makes use of collaborative technological tools, like wikis and forums within an e-learning platform. Against the background of this problematic, the general goal of this paper is to contribute for the theoretical discussion on how active and collaborative experiences in ICT classrooms play a role on the construction of knowledge in higher education institutions (HEIs). We did, however, limit our field of study to the context of the curricular unit of CRM (Customer Relationship Management) Systems, included in the last semester of the last year of the study plan of the first cycle of studies of the Marketing course available at the ISCA-UA (Higher Institute of Accounting and Administration of the University of Aveiro), Portugal. Based on the pointed outlines and within the curricular case presented, we intend to: (1) understand how collaborative learning environments get students actively involved in the learning process; (2) perspective the role of collaborative tools at the level of group work and (3) find out how students assess their performance within a working group.

This article is organized into five key points. After the introduction we try to contextualize the use of ICT at the level of active and collaborative methodologies in the teaching and learning processes in higher education. The next section focuses on the methodological aspects of the study, including the context of the case study used in the research and techniques for collecting and processing data. The fourth section is devoted to present and discuss the results obtained. The paper ends with the main conclusions of the study.

2. CHALLENGES IN LEARNING AND TEACHING IN HIGHER EDUCATION
Trying to ensure that every student who enters the work market bears a set of personal attributions acknowledged as essential, challenges HEIs with the need to activate new ways to produce and disseminate knowledge. Bearing this context in mind, it is possible to realize a society which generates challenges over a set of not only

professional competences, but also of personal and social ones.

2.1. The changing paradigm

In the report made for UNESCO by the (International Commission on Education for the Twenty-first Century, 1996) a complementary mission for education is immediately referred: that of fructifying the creative talents and potentialities of all individuals. In that very same report, the need for a lifelong learning process is strengthened, as one of the keys to access education. More, the adequacy of the higher education system to the teaching-learning model sustained by the Bologna Process, did also jeopardize a profound change of paradigm: in order to achieve the European student profile, HEIs should emphasize horizontal competences which render students responsible for their learning processes, thus leaving the teachers with the task to facilitate and orient those processes. The implementation of these guidelines does inevitably create the need to re-evaluate the pedagogical activities at the level of goal definition and assessment, as well as, particularly, at the level of execution and follow-up of the methodological processes. Also, the new demands regarding students' skills have generated profound implications in the change of the pedagogical paradigm to student-centered methodologies, which make the student an active element in learning, properly guided by tutorial support. These set of problems induce some authors (e.g. Silén & Juhlin, 2008) to declare that conventional methods of instruction are inadequate for what needs to be known and so, there seems to be more and more agreement that higher education methodologies have to be rethought. The arguments involved in such methodologies are multidimensional and diversified.

2.2. Active and collaborative learning in higher education

Active learning has received considerable attention over the past several years. Often presented as a radical change from traditional instruction, active learning has appealed strong advocates among those looking for alternatives to traditional teaching methods, while disbelieving ones regard active learning as another fashion trend (Prince, 2004). It is not possible to provide unanimously accepted definitions for all of the vocabulary of active learning since different authors have different interpretations. Still, it is possible to provide some generally accepted definitions and to highlight distinctions in how common terms are used (Prince, 2004).

Generally defined as any instructional method that engages students in the learning process, the core elements of active learning are student activity and engagement in the learning process. While, on the one hand, Kaufman *et al*. (1997) define collaborative learning as a spectrum of instruction that involves small groups of students who have assigned an academic goal, on the other hand, Prince (2004) defines cooperative learning as a structured form of group work where students pursue common goals while being assessed individually. Although some authors (e.g. Kaufman *et al*., 1997) distinguish between collaborative and cooperative learning as having distinct historical developments, this study will assume the perspective of Panitz (1996) and Prince (2004) that collaborative learning encompasses cooperative learning as, in either interpretation, the core element is the emphasis on student interactions rather than on learning as a solitary activity.

Despite the empirical support for active learning is extensive, not all is compelling. In fact, while several authors (e.g. Bonwell & Eison, 1991) conclude that it leads to better student attitudes and improvements in students' thinking and writing, motivating students for further study and developing thinking skills, others (e.g. McKeachie, 1972) admit that the improvement of active learning over lectures seem to be small. But, as Prince (2004) suggests, the variety of instructional methods labeled as active learning muddles the issue. In the analysis that the very same author does of the two core elements of active learning (introducing activities into the traditional lecture and promoting students' engagement) some conclusions arise. First, that simple periodically pauses procedures during classes, provide a baseline that can improve the effectiveness of lectures, as it has to do with student attention span. But, simply introducing activity into the classroom may fail to capture the students' attention if the activities are not designed around important learning outcomes. So, second, it is central to promote thoughtful engagement on the part of the student which is one of the most important predictors of success in college.

2.3. Using ICT to promote active and collaborative practices

A possibility to promote active and collaborative practices is that of fostering the change of a traditional teaching system to adopt and incorporate ICT in teaching and learning. The importance of computer supported learning is an emerging branch of the learning sciences concerned with studying how people can learn together with the help of computers. But, as Stahl, Koschmann and Suthers (2006) claim, the interplay of learning with technology has problematized the very notion of learning and called into question prevailing assumptions about how to study it. Namely, about understanding the actions and activities mediated by ICT or about knowing in which fields and to what extent there are obstacles or facilitators, and the risks in using ICT in teaching and learning at university level (Ludvigsen & Morch, 2007; Vajargah, Jahani & Azadmanesh, 2010).

It is not possible to ignore the potential of ICT and, specially, the internet and its expansion through the development of computer networks. The thrilling potential of the internet to connect people in innovative ways provided a stimulus for computer supported collaborative learning research. As ICT developed, unpredicted barriers to design, disseminate and effectively take advantage of innovative educational software became more and more apparent (Stahl *et al.*, 2006). As mentioned in the report made by the International Commission on Education for the Twenty-first Century (1996), this technological revolution obviously constitutes an essential element in the understanding of our modernity, as it creates new forms of socialization and, even, new definitions of individual and collective identity. For example, when presenting the theoretical rationale for a pedagogical and technological scaffolding of a computer supported collaborative learning environment, Ludvigsen and Morch (2007) argued that it emerged in response to skills that were previously associated with deep learning, which are important in a knowledge-based society. In the perspective of Lehtinen (2003), the arguments for the use of ICT in education are characteristically based on various self-evident benefits of information and communication technology: the possibility for a beneficial relationship between the system and the learner; the possibility to facilitate the understanding of the phenomena under study; the possibility of advantages in simulating real-life situations; or the possibility of a useful tool for synchronous and asynchronous communication between the teacher and students and among students. But the opinions are not consensual. The very same author, (Lehtinen, 2003), as well as others (e.g. Ludvigsen & Morch, 2007) warns to several paradigms in the use of ICT: the assumption that learning is seen as the process of change in social relations in which the learner is imperatively situated; the problem of mutual understanding in ICT applications; or the insight concerning which conditions one can expect students to develop deep knowledge using ICT. These can give an idea of how ICT have been played a significant role in the development of new theoretical approaches on teaching and learning and how important it is to understand technology-based environments that can provide learners with new opportunities for activities which are beneficial for knowledge construction.

Previous research has been done on student collaboration using wikis (Judd, Kennedy & Cropper, 2010). Widely promoted as collaborative writing tools, wikis are gaining in popularity in educational settings. However, while wikis include features that are designed to facilitate collaboration, the few empirical studies that have considered this issue report that their use do not necessarily ensure or even encourage collaborative learning behavior (Judd *et al.*, 2010). Two important aspects denoted by Judd *et al.* (2010) show evidence that the majority of students' contributions were made late in the activity, which made the possibility of extensive collaboration unlikely; and that students made little use of the wiki's commenting feature - a critical tool for contextualizing and coordinating their contributions for and with others - which also made the possibility of extensive collaboration unlikely.

Online discussion forums are an increasingly common use of new information and communication technologies in education. As proposed by Judd *et al.* (2010), the common conception of the online discussion forum is that it is a virtual learning environment in which students are likely to learn as much from one another as from course materials or lectures. This point of view emphasizes that what students learn can be seen as a creative cognitive process of offering up ideas, having them criticized or expanded on, and being able to reshape ideas in the light of peer discussions. In other words, the rationale on forums shows evidence that, by reflecting on peers' contributions in online discussions and articulating emergent understanding, students engage in higher-order processing of information and are led towards the construction of personal meaning which is not individualistic, but rather a product of the students' interaction and collaboration. Judd *et al.* (2010) refer to some studies that point in the same direction: forums increase participation and collaborative thinking through the provision of asynchronous, nonhierarchical and reciprocal communication environments, as well as the academic discourse promotes increased student engagement, critical analysis and reflection, and the social construction of knowledge. Also, the findings of Yukselturk (2010) emphasized that students' workload and responsibilities as well as the planning of instructional activities in discussion forum, should be taken into account in designing online discussions.

3. METHODOLOGY

The curricular unit of CRM Systems was planned not only to allow the maxim participation of the students, but also to be centered on promotion of deep learning and reasoning skills by the students. To allow this, the curricular plan was designed to involve different methodologies to each specific learning outcome. To accomplish this, students were organized into groups according to some specific guidelines. The groups were mainly constituted of four students with homogeneous characteristics: similar grade average on a specific set of units of curricular plan, compatibility of time to work in group, and same registration system in the course. This information was previously identified through a simple questionnaire available on the university's e-learning platform. In a rotative mode (by activity), each group chose a student to be coordinator. Beyond the accomplishment as a group member, the coordinator has the added responsibility of ensuring the observation of a

set of working rules, of reading and correcting all documents produced to ensure consistency among the work done, and of promoting cooperation and mutual aid between members. At the end of each activity, each student assesses not only his own performance but also the one of each of his colleagues.

Framed by the goals presented, four main learning outcomes can be defined. First, a successful learner from this curricular unit has to be able to identify the major phases that support customer relationship. In order to demonstrate that this specific learning outcome has been achieved, students are encouraged to prepare and present a lesson about each phase of the process. Therefore, after teacher has introduced the topic and encouraged students with questions for reflection (two lessons), students are invited to prepare and present their own lessons on the phases of customer relationship management. Finally, this topic is closed with another class where the professor presents and discusses with the students some important metrics to determine the implementation degree of each phase of the managing customer relationships process.

In what respects to the second learning outcome, on successful completion of the course, students have to be able to recognize the various levels of a CRM system and how they are integrated and related to the organizational objectives of relationship marketing. To demonstrate that this second learning outcome has been attained, students are encouraged to research about case studies describing, totally or partially, experiences on implementation of a CRM system. In this case, in each class and after teacher has presented the background of a CRM module system and has explained the functionalities that should support it in an organizational context, a brief contact with the CRM software is enhanced. In the second part of each class, one group presents the case study and the results of their analysis according to a formatting model previously set by the teacher. In particular, students are oriented to identify the type of situation portrayed, the main theme, the problem outlined and the decisions taken, the qualitative and the quantitative aspects highlighted, the technological solutions used and the functionalities that aim to support them.

While in the third learning outcome, students have to identify, distinguish and use the various features of each module of a CRM system and recognize how the modules are intertwined, in the fourth leaning outcome, students have to design and monitor a program of implementation of a CRM system (including the definition of the business plan, the analysis and the selection of a technological tool according with the business' objectives), and to manage the several projects that can be integrated in the process. The validation of these two learning outcomes is organized in two complementary parts, with students working in groups. On the one hand, students are asked to develop a summary report that conceptually characterizes the CRM systems. This is done using a wiki collaborative tool available on an e-learning platform. On the other hand, students are encouraged to simulate a business environment and the management of customers relationships using a complete open source software available on the market (VTigerCRM). This software allows the use in collaborative mode. In the end of course, the groups of students presented their business in class and deliver to the professor the portfolio describing the main results of their experience with the software. All these activities are also supported by discussion forums restricted between each group, and available through the e-learning platform.

Finally and in the last class, students are encouraged to answer one more questionnaire to register their opinion about the teaching-learning methodology used. It is important to notice that, in this case, the answers are pre-oriented on a Likert scale with 6 points, forcing the respondent to take a negative or positive position about his own perceptions. This is the unique anonymous questionnaire. A total of 28 students that attended the curricular unit in continuous assessment were included in the study. Data was collected through questionnaires available on the e-learning platform Moodle. Descriptive statistical techniques were used to analyze quantitative data.

4. RESULTS AND DISCUSSION
Within the methodology previously defined, nine groups were found; three with 4 members, four with 3 members and two with 2 members.

4.1. Self-assessment and hetero-assessment of groups' activities
Data analysis concerning self and hetero-assessment of the groups' activities was organized around the four main learning outcomes previously defined: presentation of a lesson [Table 1], analysis and presentation of a case study [Table 2], and simulation of a business environment [Table 3].

Table 1:. Results of self- assessment and hetero-assessment by groups concerning the presentation of a lesson

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members)	Deviation between coordinator and other	Grade of self-assessment (coordinator)	Average grade of self-/hetero-
A	4	4	6	8,3	-2,3	4	4,4
B	4	3	7	4,0	3,0	4	4,0
C	3	3	22	20,0	2,0	4	4,7
D	4	4	37	26,3	10,7	4	4,8
E	2	2	10	10,0	0,0	5	5,0
F	3	3	12	12,5	-0,5	4	4,0
G	3	3	15	9,5	5,5	5	4,7
H	3	3	10	10,0	0,0	5	4,3
I	2	2	10	7,0	3,0	4	3,5

In what concerns the presentation of a lesson, the results of self- assessment and hetero-assessment by groups show that 27 out of 28 (96%) students did answer the questionnaire [Table 1]. Noteworthy is the fact that the majority of the groups present a positive deviation between the time spent by the coordinator and the average time spent by other members, which seems to indicate that the coordinator did responsible shoulder his role. In fact, we can assume that if it was not like that, all the group work would have been compromised and the necessary time to fulfill the task proposed (prepare the presentation of the lesson) would be longer. However, the substantially different results between the groups relatively to the average time spent in the activity, makes us wonder about the relative merits of the work done. However this aspect does not seem to have occurred since all groups self-assessed with a 4 or even a 5 grade (good or very good performance). So, maybe the collaborative task did really get students actively involved in the learning process.

Table 2:. Results of self- assessment and hetero-assessment by groups concerning the analysis and presentation of a case study

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members)	Deviation between coordinator and other	Grade of self-assessment (coordinator)	Average grade of self-assessment
A	4	4	4	3,7	0,3	4	4,3
B	4	3	3	4,0	-1,0	5	4,3
C	3	3	6	5,5	0,5	4	3,7
D	4	3	8	7,5	0,5	4	4,3
E	2	2	10	11,0	-1,0	5	5,0
F	3	3	20	7,5	12,5	4	4,0
G	3	1	-	3,0	-	-	4,0
H	3	3	10	11,5	-1,5	4	4,0
I	2	2	5	4,0	1,0	4	4,0

As regards to the analysis and presentation of a case study, Table 2 shows that 24 out of 28 (86%) students did answer the questionnaire. In this situation there are more cases of discrepancy between the time spent by the coordinator and the average time spent by other members. In fact, in three situations the deviation is negative. One more time, most groups self-assessed their performance as grade 4 or 5. Eventually, one can assume that the empirical nature of this task is much more appropriate to group discussion than the presentation of a lesson assumed to be much more in compliance with theoretical concepts and, consequently, easier to prepare.

Table 3:. Results of self- assessment and hetero-assessment by groups concerning the use of a wiki tool and the simulation of a business environment

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members)	Deviation between coordinator and other	Grade of self-assessment (coordinator)	Average grade of self-assessment
A	4	2	25	12,0	13,0	5	4,5
B	4	3	-	9,7	-	-	4,3
C	3	3	20	32,5	-12,5	5	4,6
D	4	3	24	24,0	0,0	4	4,3

E	2	2	40	35,0	5,0	5	5,0
F	3	2	-	30,0	-	-	4,0
G	3	3	20	7,0	13,0	5	5,0
H	3	3	8	50,0	-42,0	4	3,9
I	2	2	6	48,0	-42,0	3	3,5

The Table 3 shows that the rate of respondents concerning to the last activity (use of wikis and CRM software) was of 82%, answering 23 students. In this case, the discrepancy between the time spent by the coordinator and the average time spent by other members is much higher and is verified in most groups. The performance is in most case classified as 4 or 5. The verified decrease of respondents in consecutive surveys could be explained either by saturation with consecutive requests to fill out questionnaires, or because the last questionnaire was completed by the end of the semester. Nevertheless, this isn't significant. Similarly to the previous results, and also probably, the complexity of the task (simulation of a business environment) seems to justify the greater involvement of the students and, consequently, the more time required to complete the mission. Another important conclusion is the possibility to perspective the role of collaborative tools at the level of working groups: less pragmatic tasks are more likely to be easily prepared by groups while more practical ones not only need more time but, more important, need the discussion inside the group.

Noteworthy is the fact that, in some groups, there is a big and negative deviation between the time spent by the coordinator and the average time spent by other members. We think that, maybe, this can be a symptom that, in these groups and consecutively, the same student performs a more role active even in activities where he isn't the coordinator. That conclusion seems even more important as this situation occurs in small groups of 2 or 3 elements members. Finally, it seems that data reflects the level of effort expected for each activity: the use of a wiki tool and the simulation of a business environment take more time than the presentation of a lesson and this, in turn, takes more time than the analysis and presentation of a case study.

4.2. Self-assessment of the teaching-learning methodologies used in class
In order to realize students' opinions on the teaching and learning methodologies used in the class, students were invited to answer a last and anonymous questionnaire available on the Moodle platform. In this questionnaire answered nineteen students aged between 20 and 39 years, eight males and eleven females. More, eleven students reclaim to be registered in "ordinary" scheme, seven as "student employee" scheme, and one as "leader associative". Concerning to their ability to write or communicate orally, in Portuguese language, all the students reported to have a satisfactory level, with the great majority assuming a good or very good ability. However, and in what concerns the ability to understand written and oral English, roughly a quarter of students reported that their ability was not satisfactory, Roughly half of the students rated their ability as "satisfies well" or "satisfies very well" [Table 4]. This is an important issue, because all the activities proposed implied to read and analyze literature, in English language, and consequent oral exposition, in Portuguese language, in class.

Table 4: Ability of expression/understanding of portuguese/english languages

	Number of students			
Scale	Ability to write (in Portuguese)	Ability to communicate orally (in Portuguese)	Ability to understand written English	Ability to understand oral English
Satisfies very well	6	10	3	4
Satisfies well	11	7	8	8
Satisfies	2	2	4	2
Satisfies little	0	0	2	3
Satisfies very little	0	0	0	1
No satisfies	0	0	2	1

Finally, we tried to understand the perceptions of the students about the resources and teaching and learning methodologies used in the class. As we can confirm in Table 5, the central tendency metrics show that students considered the use of collaborative tools very useful (average and mode 4). Considering each specific activity, we can conclude that the students considered the methodology used in the activity "simulation of a business" as the most suitable, followed by the "presentation of a lesson", and in last, "analysis and presentation of a case study".

Table 5:. Resources and methodologies used in support of teaching-learning process

Resources and methodologies	Average	Mode
Use of collaborative tools (e.g. forums, wikis, etc.)	3,8	4
Presentation of a lesson	4,1	5
Analysis and presentation of a case study	3,5	4
Simulation of a business	4,6	6

It is important to notice that all the activities proposed had a component in the final grade on the CRM systems curricular unit. In fact, 40% from assessment on the evaluation test about the first learning outcome, 40% from assessment on the evaluation test about the second, third and fourth learning outcomes altogether, and 20% on the classification obtained in the following three items: activity of presentation a lesson, activity of analysis and presentation of a case study, and attitude in class during the semester (weights 50%, 20% and 30%, respectively). Also, we enhance that this class had the particularity to include students aged from 20 to 50 years, and obviously with different availabilities of time, given that many of them were employed. Furthermore, as the majority of the students were in the last year of the course, they were also doing their internship programs in different companies.

Despite the heterogeneity of the class and the constraints expressed in the preceding paragraph, students were receptive and motivated to carry out the proposed activities. Nevertheless, the two aspects denoted by Judd *et al*. (2010) of that the majority of students' contributions were made late in the activity, which made the possibility of extensive collaboration unlikely; and that students made little use of the wiki's commenting feature - a critical tool for contextualizing and coordinating their contributions for and with others - which also made the possibility of extensive collaboration unlikely, was completely verified in this case. In general, and as specified in literature by Judd *et al*. (2010), students delayed their contributions to the activities (especially in the last one) and ended up making little use of the potential for content development collaboratively via wiki tool, given the backward state of work in most groups.

5. CONCLUSIONS

More than a few authors (e.g. Neo & Neo, 2004) give emphasis to the infusion of the multimedia technology into the education arena. Particularly, traditional educational materials are been translated into interactive electronic forms through the use of multimedia tools, with the purpose of convening the message in an interactive learning environment. So, the conventional chalk-and-talk method is moving away to one which uses multimedia platform in teaching and learning. And, as the present generation becomes more familiar with computers and the internet, they are going to expect information in the classrooms to be delivered in the same design. Within the research questions proposed, one can say that the study, although it did not embrace a huge number of participants, points toward some understanding of how a collaborative learning environment seems to get students actively involved in the learning process mainly if the tasks to be perform have an empirical component. More, one can say that the study also has shown that students seem to identify themselves with the need to be involved in simulations of their future professional activity, as well as with the need to regulate their own learning (preparation and presentation of lessons) and to promote discussion not only between peers but also with the teacher.

REFERENCES

Bonwell, C. C., & Eison, J. A. (1991). Active learning: creating excitement in the classroom ASHEERIC Higher Education (Vol. Report No 1). Washington DC: George Washington University.

International Commission on Education for the Twenty-first Century. (1996). Learning: the tresure within. Paris: UNESCO.

Judd, T., Kennedy, G., & Cropper, S. (2010). Using wikis for collaborative learning: assessing collaboration through contribution. Australasian Journal of Educational Technology, 23(3), 341-354.

Kaufman, D., Sutow, E., & Dunn, K. (1997). Three approaches to cooperative learning in higher education. The Canadian Journal of Higher Education, XXVII(2,3), 37-66.

Lehtinen, E. (2003). Computer-supported collaborative learning: an approach to powerful learning environments. In E. D. Corte, L. Verschaffel, N. Entwistle & Merrieboer (Eds.), Unravelling basic components and dimensions of powerful learning environments. Turku University: Pergamon.

Ludvigsen, S., & Morch, A. (2007). Computer-supported collaborative learning: pedagogical and technological scaffolding Int'l Encyclopedia of Education's 3rd Edition (Vol. Learning and Cognition): Elsevier.

McKeachie, W. (1972). Research on college teaching. Educational Perspectives, 11(2), 3-10.

Neo, T.-K., & Neo, M. (2004). Integrating multimedia into the Malasyan classroom: engaging students in interactive learning. The Turkish Online Journal of Educational Technology - TOJET, 3(3).

Panitz, T. (1996). Collaborative versus cooperative learning: a comparison of the two concepts which will help

us to understand the underlying nature of interactive learning Retrieved 16, May, 2012, from http://home.capecod.net/~tpanitz/tedsarticles/coopdefinition.htm

Prince, M. (2004). Does active learning work? A review of the research. Journal of Engineering Education, 93(3), 223-231.

Sife, A. S., Lwoga, E. T., & Sanga, C. (2007). New technologies for teaching and learning: challenges for higher learning institutions in developing countries. International Journal of Education and Development using Information and Communication Technology, 3(2), 57-67.

Silén, C., & Juhlin, L. (2008). Self-directed learning - a learning issue for students and faculty. Teaching in Higher Education, 13(4), 461-475.

Silva, B. D. d., Gomes, M. J., Oliveira, L. R., & Blanco, E. (2002). The use of ICT in higher education: work in progress at the University of Minho. Paper presented at the Use of ICT in Education in Southern Europe: research and reflections, part of the 2002 European Conference on Educational Research (ECER, 2002), Lisbon. http://www.uoc.edu/dt/20137/index.html

Stahl, G., Koschmann, T., & Suthers, D. (2006). Computer-supported collaborative learning: an historical perspective. In S. R. K. (Ed.), Cambridge handbook of the learning sciences (pp. 409-426). Cambridge, UK: Cambridge University Press.

Vajargah, K. F., Jahani, S., & Azadmanesh, N. (2010). Application of ICT in teaching and learning at university level: the case of shahid beheshti university. The Turkish Online Journal of Educational Technology - TOJET, 9(2).

Yukselturk, E. (2010). An investigation of factors affecting student participation level in an online discussion forum. The Turkish Online Journal of Educational Technology - TOJET, 9(2).