

COLLABORATIVE LEARNING IN VIRTUAL ENVIRONMENT

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Abstract

E-learning became a significant part of the educational process in institutes, organizations or companies providing education services, as it offers fast access to learning content, facilitates and supports online interaction and assessment. One of the key concepts used very often by researchers studying the learning process in virtual environment, is collaboration, seen as indispensable element for learning in groups or teams of learners. The study described in this paper underlines the importance of online informal activities for teams constituted of learners involved in a process of learning. The results revealed that there is a correlation between the number of informal activities initiated by the learners organized in teams and the final marks of these teams.

Keywords: e-learning, collaborative learning

In a continuous development over the last three decades, the new technologies offer the possibility for students and learners to continue online the process of learning through collaboration, process initiated face-to-face in classical learning environments in the classrooms, courses or seminars. Moreover, for distance learning the new technologies support the entire process of learning and teaching right from the beginning. However, using an e-learning platform's components is not enough for collaboration to occur or does not offer the guarantee for achieving the best results by the groups of learners using them. There are at least two important factors in virtual environment, influencing positively the process of collaboration: firstly, the internal structure of the learning and/or working group or team and secondly the communication tools available for the members of these groups or teams [Whitehead and Stotts, 2000; Hossain and Wingand, 2004].

Introduction

Depending on the research discipline, "collaboration" has been analysed from different perspectives: collaboration between peers, between working departments, companies, through technology [Chinowsky and Rojas, 2003; Touminen and Eriksson, 2005] and in the condition of face-to-face interaction [Katzenbach and Smith, 1993].

Hossain and Wigand [2004] suggest that collaboration in virtual environments "refers to the use of information and communication

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technologies for supporting the collective interaction among multiple parties". As mentioned above, online collaboration is highly influenced by the technologies used by individuals involved in a task solving process [Whitehead and Stotts, 2000; Hossain and Wingand, 2004]. Hence, we can mention about a classification of these technologies: communication technologies, cooperation technologies and collaboration technologies [Chinowsky and Rojas, 2003]. One of the most prominent differences between these three categories is given by the type of communication supported: asynchronous or synchronous communication. The technologies facilitating synchronous communication (i.e. visually, orally and offering the opportunity to exchange and manipulate data) were defined by Chinowsky and Rojas [2003] as collaboration technologies.

Sociability is a key part of human nature [Howard, 2003] and when people get the opportunity to talk to each other, cooperation increases significantly [Kollock, 1998]. Online communication and implicitly communication in online learning environments has improved because a lot of peripherals like web cams, microphones and phones are available. These devices minimise the perceived distance between interlocutors and enhance the clarity and quality of the sent or perceived information. By providing a context for interaction to learners on an e-learning platform, the collaboration technologies [Chinowsky and Rojas, 2003] became factors which might influence the quality of collaborative learning process.

The main theories in media area, released in the last decades, claimed the superiority of face-to-face communication [Fayard and Metiu, 2008] and created communication tools' ranks based on their functionalities which bring online communication characteristics close to face-to-face communication characteristics. In the context of a study on teleconferencing, Short et al. [1976] came up with the social presence theory (SP) which explains the influence of different communication tools on social interaction. Social Presence Theory highlights that a medium's social effects are principally caused by the degree of social presence, and it was defined "as degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" [Short et al., 1976, p 65]. In the case of using any communication tool the degree of SP is given by its facility for transmitting non-verbal gestures or the facial expression of interlocutors (e.g. smile, eye contact, direction of looking, posture, physical distance, personal topics of communication).

When Short and his collaborators generated this theory, computer mediated communication (CMC) was not widely available but over the last three decades, the progress of technology has led to new results in the communication research field. Thus, new attempts have been initiated to adapt social presence theory to new developments in CMC and e-learning.

Rourke, et al. [2002] claimed that social presence is the ability of learners to project themselves socially and affectively into a community of inquiry. Walther [1992] concluded that researchers studying social presence topic have suggested that communicators develop individuating impressions of others through accumulated CMC messages and based upon these impressions, they may develop relationships.

In the case of online learning, communication is essential; moreover, the necessity of information sharing during learning became an imperative condition [Lave and Wenger, 1991; Wenger, 1998; Mayes, 2001] for collaboration and it occurs from direct implication of the learners in online social activities.

Based on SP theory [Short et al., 1976] and on Zone of Proximal Development [Vygotsky, 1978], another well known theory about learning, we designed a study which aimed to explore how information sharing process and collaboration could be influenced by the use of communication tools integrated in an e-learning platform. The complex process of learning involves many interdependent factors: communication, the support offered by the group and exercising. A learner's permanent interaction with his/her group and access to the groups' collective experiences and knowledge, contributes to an ascendant process of learning through continuous feedback and guidance. Vygotsky's [1978] theory and concepts are highlighting the influence of social interaction in the transition from one level of knowledge to another one, during the learning process and the importance of collaborative learning.

In our research context we assumed that social presence represented by all informal details within e-learning platform (profiles, blogs, forum comments, video and audio conference etc) offered by learners, increases the level of trust, thus the level of collaboration between learning team members. In our sense, informal details refer to all information offered by learners before and during their collaboration, information which does not refer strictly to the learning content.

Study design

This study involved 18 participants (17 students and 1 lecturer) from Johannes Kepler University (JKU) who used Sakai as an e-learning platform. All participants enrolled and attended a course on "Privacy, Security and Trust in Personalized Systems", a course which comprised two face-to-face meeting sessions in JKU, the rest of the activity evolving mainly around online activities. At the end of the semester, teams consisting of 3 to 4 members had to present a project or a case study related to the course subject

and also, to complete a final exam. The tutor proving course and its content on the e-learning platform was not involved in the study.

Before the first live meeting, all students were informed that they can familiarize themselves with Sakai and they can contact and get to know their colleagues using the online platform's communication components. They were given two weeks time between this announcement and the first lecture. All of them had the opportunity to introduce themselves to the group and start informal discussions with peers using the forum, blogs, profile system and chatting tools within the platform. After two course sessions, the participants were asked to form teams and to work for the team project. During the process of preparing the project, all participants continued to use Sakai platform at its full capacity in order to communicate with their team members and prepare the presentation for their project.



Figure 1. *Timeline and activities during second exploratory study*

In this context, we considered all online activities to be informal if they occurred within the Sakai system and were not related to the course topic or to the project content (i.e. discussions on the forum, blog posts, comments on blogs etc). We anticipated that conducting this type of activities will increase the level of trust between participants which will lead to a better collaboration between team members.

After the final exam and project presentations, all students completed a questionnaire in order to determine the influence of communication tools on the team forming process. Moreover, they had to complete the Team Fitness Test [Bendaly, 1997] in order to get data for measuring the cohesion of the teams.

The first questionnaire used in this study regarded the initial stage of collaboration between students as members of online teams. The questions aimed to get information about the time spent on the e-learning platform during all phases in the course, the amount of information that participants read about their peers, who initiated collaboration for solving a task, what would be the stable reason in choosing a new member for an online team.

Results

Out of the total of 18 participants, 14 (11 male and 3 female) completed all parts of the course, including the questionnaire and the Team Fitness Test at the end. Since the participants were from the same university and they could meet face to face and only 5 out of 14 responders affirmed that they did not know any of their colleagues before the course, we assume that some of the results were influenced by this aspect.

Most of the teams were formed during the two week period between course sessions and none of them after the above mentioned period. Ten respondents affirmed that they were directly approached by someone or they initiated the team forming by asking online (using e-mail and the forum from Sakai) who would collaborate with them. Only three responders looked for a group to work with. This could mean that they were mainly looking for a specific project and not particularly for a group. This affirmation can be sustained also by the frequencies of the responses in the conditions of “looking for a new team member”: most of the members would use online tools to look for a new colleague meaning that five of them would write a message to the class and only two will look for an online active peer.

Like we mentioned in the introduction, we assumed that using online tools for communication, not necessarily related to the course, will increase the level of trust between team members. Using open-ended and closed questions, we evaluated the frequency of using these tools. Thus, we found out that 50% of the respondents read their colleagues’ blogs and more than 50% spent more than 10 minutes to run over their colleagues’ profiles. All groups used instant messaging tools and e-mail for communication (both within and outside Sakai) and emphasized their importance. Only one respondent affirmed that there was a lack of communication in his team and associated this with the absence of face to face meetings between the members.

Regarding the cohesion of the teams we used Team Fitness Test to evaluate the personal opinion of each groups’ member but also an overall image on groups’ opinion. Team Fitness Test measures five critical elements which assess team’s strength – *shared leadership, group work skills, climate, cohesiveness* and *change compatibility*.

After collecting the results and centralizing them, we obtained the summary as shown in the table below:

	Shared leadership	Group work skills	Climate	Cohesiveness	Change compatibility
Team 1	52	51	52	52	50
Team 2	37	29	35	33	33
Team 3	45	41	44	46	31
Team 4	52	49	46	45	45
Team 5	26	26	31	30	26

Table 1. *Team Fitness Test – Sum of scores*

Based on the teams’ average scores for the Team Fitness Test, we established each teams’ ranking as it can be seen in the table below.

	Team 1	Team 2	Team 3	Team 4	Team 5
Team members	3 members	4 members	4 members	3 members	3 members
Response	3 responses	2 responses	3 responses	3 responses	2 responses
Ranking	1	2	4	3	5

Table 2. *Distribution of team members’ responses and ranking of team based on teams’ average scores*

“Shared leadership” characteristic evaluates the role each member of the team got. The higher the score of the team, the more important and more clearly defined role each of the members in the team, had.

“Group Work Skills” score evaluates the efficiency of the teams reaching their overall objectives through accomplishing their part of work. By evaluating this aspect we were able to discover the teams which worked systematically respecting a strategy during completing their project and shared the tasks for each of its members without “skipping” a member. This reveals which team had actually only few active members and passive ones.

In the first team, one of the members approached the others and they knew each other before the beginning of the course. The fourth team, the one which was placed on the third position in the ranking scale had a member which approached one of the members and the third one became a member of the group after he evaluated the members and the type of the project. This shows members' willingness to collaborate and interest in writing their project. The results reveal the fact that teams with high scores in this category did not have problems in approving their own decisions and beliefs. In the case of the last team in the rank we could see the low scores at "Shared leadership", "Group work skills" and "Change compatibility". Despite the fact that the team got a slightly higher score at the "Climate" and "Cohesiveness" components, the scores actually anticipate one of the members' responses, saying that he is no longer interested in collaboration with the same team.

To our surprise, the final project marks did not correspond to the Team Fitness Test [Bendaly, 1997] results, as it can be seen in the table below:

Team	Final reversed mark	Teams' rank based on Team Fitness Test results
Team 4	1	3
Team 2	2	2
Team 5	2	5
Team 1	3	1
Team 3	3	4

Table 3. *Final marks for the project² and team ranks based on Team Fitness Test results*

We did not find any correlation between the final marks and the Team Fitness Test results. This could be explained through the fact that not all participants completed the final questionnaire and the Team Fitness Test and some of the teams had members who knew their colleagues before the course, which obviously influenced the results of this study. The members of the team with the best results at the Team Fitness Test declared that they knew each other before the course which was not the case with the second team in the rank. The team with the highest mark for the final project had one of the best scores for "Shared leadership" which Bendaly [1997] described as an essential aspect for a team; all its members input was valued

² The marks assigned to students are in Austrian evaluation system but in order to calculate the correlation between marks and the scores for the Team Fitness Test, we reversed them. Thus, 5 (the maximum mark in Austrian evaluation system) has become 1

by the rest of the teams and from the questionnaires we found out that the members knew all the time what everyone got to do.

The participants' answers to the open ended questions reveal that they enjoyed working together with their teams and also mentioned about the importance of the communication tools during preparing their projects. Collaborative technologies were highly used by all participants during project preparation.

Another source of data we used was the log files from the server which helped us to crosscheck and confirm participants' responses at the questionnaire, regarding the use of e-learning platform and its integrated components during preparing the final project. Because from the log files we were able to gather data regarding all participants' activity in the online environment, we checked whether informal activities among the users using the e-learning platform's tools influenced the final mark of the team at the end of evaluation.

We found that informal activities during preparation of their projects, influenced the final result of the teams as the correlation coefficient was quite strong $r=.82$ ($p<.05$). It is safe to say that the more interaction and informal activities are supported by an e-learning platform the more likely learning teams are to get to know each other and obtain better results for the final collaboration products.

4. Conclusions

This study is relevant for the evaluation of online teams' behaviour, from team forming point to the final task delivery and evaluation in a learning situation. The small number of participants in this study made us aware of the fact that we need to be careful when generalising our findings. The study should rather be seen as first exploratory steps towards a large scale research implying more variables.

Data collected during this study and the results provide hints on the nature of phenomena in online collaboration such as: importance of a user profile on an e-learning platform, the quality and quantity of shared information, and synchronous communication tools usage which will help decreasing the negative influence of the lack of face-to-face contact.

As recommendations, learners and tutors should be encouraged to use the e-learning platforms at their full capacity and communicate using the tools offered by the learning environments in order to get to know each other, especially when they live in different geographic locations and don't have face-to-face contact.

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