The efficiency of a collaborative learning in the classroom and virtual environment

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Abstract:

Classroom teaching and learning occupied a primary position within a higher education learning process until the end of the twentieth century. The development of the information-communication technology (ICT) changed this convention, making virtual learning a new way of preparing students for a challenging working environment of the 21st century. The objective of this study was to investigate the efficiency of a collaborative learning process in the real-world classroom and the virtual environment, including commonalities and differences, and emerging obstacles emerging.

1 Introduction

Classroom education has been a prevailing type of education within a higher education for many years. But in the information age, and with the faster life style, this traditional way of teaching and learning has become, to a great extent, inappropriate, especially since lecturers simply had insufficient time for explaining all the material in the classroom, solving problems on the blackboard and teaching skills to students, such as oral and written skills, critical and creative thinking, teamwork skills and new learning technologies [1]. The development of information-communication technology (ICT), has made virtual learning more and more important. In 2007 nearly 3.9 million students were participating in virtual learning at institutions of higher education in the United States of America [2].

Virtual learning presents an alternative for students to balance their private life, careers and further education. It is therefore, one of the most dynamic and enriching forms of learning in this era [3], thus offering freedom regarding the space and time dependency. On the other hand, ICT has also reshaped and restructured the working environment, especially for engineers, demanding new skills and knowledge, such as effective problem solving, information processing, the ability to interact with various ICT tools, and the ability to negotiate and communicate in multicultural and multidisciplinary environments. This new working environment, demands from lecturers to prepare today's students for new tomorrow’s assignments [4].

Knowledge and skills for innovative and complex problem solving in multicultural and multidisciplinary environments can be acquired with the collaborative learning. Collaborative learning introduces a non-traditional learning and teaching method, and has been found to significantly enhance learning and students involvement [5]. It is a process, which emphasizes system thinking, joint learning, and open communication [6], plus focusing on the development of a new knowledge and solutions, when solving real-world problems. Collaborative learning also represents a common phenomenon achieving a required goal within the educational or working process, mobilizing all the participants, embracing their
knowledge, experiences and skills. It acknowledges that each individual brings different information, ideas, values, capacities, perspectives, and approaches to learning, and historical experiences [7].

Nowadays, with ICT becoming part of education all over the world students can use collaborative learning not only at lectures in the classroom or doing homework, but also in the virtual environment. Collaborative learning becomes virtual collaborative learning when it takes place via computer communication systems [8], facilitating the interaction between students, tutor and experts in order to exchange information. A communication system can consist of synchronous and asynchronous tools for interaction and input [3], allowing discussions, exchange of ideas and outputs, such as reports or individual assignments. Synchronous tools are those, where discussions become real-time events e.g. Elluminate Live or Skype, while asynchronous discussions are usually carried out through Blackboard, Moodle, Wiki, or Doodle.

The objective of this study was to identify commonalities and differences of collaborative learning in the classroom and virtual teams (e-teams), which might occur and can cause difficulties at problem solving, achieving the required learning objectives or sometimes even stop the activities. The following questions were explored:

- What has been the efficiency of the collaborative learning in virtual and real-world classroom?
- Have there been the obstacles in real-world and virtual environment, disturbing the achievements of the learning process?

2 Collaborative learning

2.1 Collaborative learning in the classroom

Collaborative learning in the classroom usually takes turn in teams of three or four students. The team should be composed of students with heterogeneous abilities or grades, as a for the courses. In that way the weaker students in the discipline can learn from their stronger colleagues. They should organize their time for solving problems and doing homework also outside the classroom. When the team is formed, special rules of the team work are presented and accepted, including: individual accountability, positive interdependence, face-to-face interaction, regular self-assessment of team functioning and development of teamwork skills [5, 9].

2.2 Collaborative learning in virtual environment

Collaborative learning in virtual environment differs from the one in the classrooms. Usually a virtual classroom consists of students from various countries (also from different time zones), nationalities, and backgrounds, without any prior history of learning together. A virtual environment represents the only opportunity for collaboration between course participants, including exchange of ideas, thoughts, knowledge, experiences, planning activities, research results, and final report. In this environment face-to-face interactions are generally not feasible [10].

During the virtual learning process some problems might arise. To ensure the success of virtual teams, participants need collaboration e-tools, such as Blackboard, Moodle, Skype, Doodle and emails, in order to support the educational process [11]. According to Franceschi et al. [10] synchronous tools, such as supporting voice communications (Skype), can be considered as a critical factor in enhancing group collaboration, because voice adds a personal item to the communication processes and the distances between students are psychologically
shortened. However, collaboration in a virtual environment is most of the time asynchronous, accessible by students at any time of their choice [12]. Asynchronous communication may promote critical thinking, but it may also produces irritation related to the gap in response times, so-called “login-lags” [13]. Virtual discussion and information haring might also be perceived as slow [14], because non-native students might have some difficulties in express themselves in English writing. Therefore, it is important that students express their ideas and thoughts very clearly in short sentences. Also, the technology can cause problems for students with poor IT equipment, faulty electronic supply or inadequate internet services [15], because they cannot follow the virtual discussions or chats consistently.

3 Educating Methods

At the Faculty of Chemistry and Chemical Engineering in Maribor real-life team work and collaborative learning was incorporated into three courses. Five years ago students started to work in teams at Process Synthesis Course in the third year of the higher professional study program. The number of regular enrolled students varied from 15 to 25 students per study year. Students in teams solved problems after each chapter of the course material. In addition to collaborative work in the classroom, they were assigned homework. Two years ago the collaborative learning was incorporated also in the second year of the study at Process Balances and Process Calculation Courses. The work was not efficient as the one at Process Synthesis Course because there were much more students enrolled in the Courses. The number varied from 30 to 45 students. For that reason, the lecturer was sometimes not capable to efficiently help all of the teams.

In 2008 Students from the Faculty of Chemistry and Chemical Engineering were for the first time involved in the process of e-learning within the project European Virtual Seminar (EVS)[16], which is a part of the Virtual Campus for Sustainable Europe [17], coordinated by the Open University in the Netherlands. They were participating within the three courses: Decoupling of Environmental Pressures from Quality of Life, Communicating Strategies for Sustainable Development and European Water Framework Directive and the Danube basin.

The main goal of the EVS project is to foster an international, multidisciplinary dialogue on sustainable development among students from all over Europe by using modern ICT. The main features of EVS are:

- a multicultural and multidisciplinary learning community of students and staff,
- an virtual learning process, supporting collaboration between geographically distributed students,
- a learning content, consisting of current scientific, environmental, economic and societal problems, and
- a virtual learning technology based on modern ICT, facilitating collaboration, communication and interaction between students and staff.

The virtual learning process in the EVS differs greatly from that in mainstream education. There are no ‘normal’ lectures in the EVS courses. The students have to work in international, multidisciplinary groups, composed of 5 to 7 students. The group members cannot organise face-to-face meetings, and all collaboration and social processes depend on communication using modern ICT. Moreover, the learning process is spread over a relatively long period (i.e. 16 weeks) so as to create the best possible conditions for virtual collaborative learning and to allow the students to participate in the EVS alongside their regular study programmes. To support such an exceptional learning process, the EVS courses are divided into five stages:

- Orientation and go/no-go decision next stage;
- Group-forming and community building;
• Writing group research proposal;
• Research case study and writing group report and
• Rewriting group report and writing policy summary [16].

Students from both groups i.e. real-world classroom and virtual classroom, have been questioned about the efficiency of the collaborative learning and about the obstacles that emerged in both learning environments.

4 Results

To answer the above questions about the efficiency of the collaborative learning in virtual and real-world classrooms and the obstacles, disturbing the achievements of the learning process, a survey was carried out. This survey helped to evaluate the efficiency of the collaborative learning in virtual and real-world classroom, such as quality of knowledge acquired, lifelong learning, time needed for the study process in comparison with the classical teaching and learning and the quality of collaboration in team.

The survey was composed of six questions. One was of the essay type, while the others were multiple-choice type questions. Among those, one requested the explanation of the choose answer. Table 1 shows the results of the survey in both classes and the questions are presented in the Appendix.

<table>
<thead>
<tr>
<th>Table 1: The survey results.</th>
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<td><strong>Class</strong></td>
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**(without the response)**

* Classical teaching and learning – a frontal method, where the lecturer uses several tools (e.g. ppt presentations, graphs, tables, blackboard) and students are passive participants of the learning process.
Seventeen regular enrolled students of the real class filled-in the survey at the end of the 2008/2009 Process Synthesis Course and 5 students enrolled in virtual education of the EVS project answered the survey.

Results explanation:

1st question:
All students of the real class expressed that courses and lectures based on problem solving, e-learning, and collaborative learning were appropriate for them because they worked continuously on the topic, and in that way they could help each other and check their knowledge. Such work was diverse, dynamic, interesting and lectures were not tiresome. It was easier to learn the theory at home because of previous problem solving.

In virtual class all the students expressed that the non-traditional teaching methods were appropriate for them, because they had opened new dimensions, allowing creativity, formation of new ideas, virtual brainstorming, and flexibility of the learning process. They were able to choose when to work/write/learn, but such learning required a full commitment of all the individuals involved into group. The success was therefore based on personal involvement, motivation and passion regarding the learning process. Furthermore, they claimed that during the virtual learning they were practising English.

2nd question
The majority of students in real class (82 %) expressed that non-traditional teaching and learning methods gave them more knowledge as classical lectures.

In the virtual class 60 % of the students claimed that non-traditional teaching methods gave them more knowledge as classical one, while 40 % indicated that non-traditional teaching methods gave them the same amount of knowledge as classical lectures.

3rd question
About two third of real class students thought that the acquired knowledge obtained with non-traditional learning methods, was holistic, deeper and sustainable in comparison with the classical lectures. One third of the real class students said the acquired knowledge was the same as by the classical lectures.

In virtual classroom the majority (80 %) of students believed that knowledge acquired with non-traditional learning methods was holistic, deeper and will memorized it longer, while 20 % of the students thought that the knowledge was the same as by classical lectures.

4th question
More than half (59 %) students of the real class expressed that with the non-traditional learning they spared more time as by classical lectures and learning. About one fourth (23 %) claimed they spent less time and others (18 %) said they spent equal time.

In the virtual class 40 % indicated that they have spared more time in comparison with classical lectures. Also, 40 % of the students thought that virtual learning has been more time consuming and 20 % thought that time consumed were equal as by the classical learning.

5th question
More than half students (59 %) of the real class expressed that the collaboration among colleagues in the team was excellent but 41 % of students said it was good. They explained that each of them could express their opinion and the work was in general divided equally. They helped each other and could ask the colleagues if one did not understand the problem properly.
In the virtual class all the students denoted collaboration as good. It was not excellent, because sometimes a lack of motivation occurred, especially in the time of individual research. Within this timeframe were not any discussions and collaboration between students and the consequence was that nobody knew what other participants were doing and how far they were with their research. Another problem of collaboration was that sometimes some participants disappeared (due personal circumstances) for 3 weeks or more and there was not any possibility to reach them and this has effected a group work negatively.

6th question

Two third of students in real class expressed that disharmony in the team appeared at the task or problem solving stage, 12% indicated that disharmony appeared at the personal stage in general when someone did not attend the lectures or did not want to cooperate at problem solving. 23% of students did not respond the question.

In the virtual class 20% of students expressed that the disharmony in the team occurred at task or problem definitions stage. 40% believed that disharmony was a consequence of personal virtual relationships (individual conflicts within the group). Other 40% claimed that disharmony mostly occurred at the task or problem solving stage, where the disagreements about the research methods, workload, and dissatisfaction with the results occurred.

5 Discussion and conclusions

The success of virtual learning depends on mutual relationships, communication, and group motivation. All these facts are important, because in virtual world there is an absence of real-world contacts, emotions, body languages, and voices. In a virtual environment students perceive other students through their writings, but they do not know anything about their capabilities, characters, and other personal features. For many students it is very difficult to function in the virtual world.

These research findings suggest that non-traditional teaching methods (collaborative work, virtual learning) are appropriate for several reasons. Collaboration among students influences the quality of learning process. Students have opportunity to brainstorm, and to clarify problems within a group and to come up with new solutions. Most of the required workload is done in the group through collaboration and there is no need for additional work at home. In the group students also tend to learn quicker and gain several skills, such as how to learn, who to ask for help, from whom to learn, or how to find useful information.

The results of the survey show that group collaboration in virtual classes is more efficient than in real ones, regarding the knowledge acquired. In virtual teams students claim that the knowledge is more holistic, deeper and last longer comparing to real class. Due the “login-lags”, students are forced to do the assignments alone and in advance. From an individual perspective many of the questions and doubts are solved before the answers from the other students are received. Because of individual activities within a group the knowledge acquired tends to be longer lasting and deeper. In both classes students favour collaborative learning, although they claim that is more time consuming. In virtual classes students have to get know with the IT tools, which are sometimes very hard and require a basic knowledge of computer and media science, not needed by classical learning.

Group collaboration was denoted as good (not excellent) due to conflicts, emerging at personal and problem solving level. Collaboration in virtual teams tends to be very stressful, because there are no face-to-face interaction between students, tutors, and experts. Disharmony on individual and process levels in the team holds back the efficiency, taking energy, and provoking negative feelings. Feelings are those, which influences on the quality of future work in the team. Anger, in-disposed and the absence of will can cause that activities progress very slow or even stop.
There is room for improvements in collaborative learning. More efforts could be directed into improving motivation in virtual classes. Such motivation could be strengthened by creating the sense of community and trust between students. In order to foster trust between the students a written commitment should be signed at the beginning of collaboration, preventing people from changing their attitudes later. Such a commitment should also include an agreement about the frequency of the virtual meeting, preventing “login-lags”. Communication and interactions in virtual learning on three levels (student-student, students-tutor and students-expert) are also very important. The communication between students should be clear, direct and quick (if possible within 24 time frame). It is also important that tutors are available for questions. However, virtual collaborative learning presents a future challenge and more experiences will be needed.

References:

Appendix: The survey questions

1. Courses and lectures based on problem solving, e-learning and collaborative learning (non-traditional learning methods) were:
   a) appropriate for me, because …
   b) not appropriate for me, because……..

Please, specify your answer.

2. The above mentioned methods gave me
   a) more knowledge as classical lectures*
   b) less knowledge as classical lectures*
   c) the same amount of knowledge as classical lectures*

3. The acquired knowledge, obtained with non-traditional learning methods, was
   a) holistic, more deep and sustainable (will last longer)
   b) superficial and short (you already forgot a lot)
   c) equal as by the classical lectures*

4. With the non-traditional learning I spared
   a) more time as by classical lectures and learning
   b) less time (collaborative learning, e-learning and solving problems took more time as classical learning)
   c) equal time (no differences in comparison with classical learning)

5. How would you estimate the collaboration among colleagues in the team?
   a) the collaboration was excellent
   b) the collaboration was good
   c) the collaboration was bad

Please, enter the explanation of the selected answer.

6. Disharmony in the team appeared at the
   a) task or problem definition stage (already at the beginning of the assignment)
   b) task or problem solving stage (disagreements about the research methods usage, dissatisfaction with the results or goals obtained)
   c) personal stage (individual conflicts within the group or team members, cultural differences, personal conviction, less motivated individuals in the team, etc.)

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