Technology Assisted Contextualized Collaborative Learning Environment (TACCLE)

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Abstract. *This paper proposes an augmented mode of student centered self learning framework; a contextualized virtual collaborative learning environment using various Web2.0 technologies. The current study focuses on investigating students' achievement in the context of gender, linguistic and socio-cultural differences. Empirical observations proved that the proposed framework improved collaborative learning and the academic performance of students significantly.*

1. Introduction

The association between technology and learning environment has drawn much attention [5-9]. Web2.0 technologies based virtual environment has become an integral part of current teaching and learning processes. Association of technology and learning environment in the context of socio-cultural and linguistic diversity is an interesting problem to explore. Current study focuses on such differences in the Gulf Region of the Middle East and enhancement of collaborative learning in the context of these differences.

One of the main issues in this region is the constrained communication due to gender differences. Motivating students

to communicate and discuss among themselves is a serious concern of instructors. Collaborative learning enhances learning experience of groups of students with mixed learning abilities to achieve a common goal. Many researchers across the world have investigated different strategies required to enhance this form of learning [1].

The socio-cultural customs of the Gulf Region are unique compared to the rest of the world. Students in this region are acutely aware of gender differences during class room and group discussions. They give importance to their cultural and traditional principles/practices while forming discussion groups. It is observed that students normally do not volunteer for a face to face discussion with opposite gender. Therefore, to effectively achieve the real objectives of learning, it is important to form collaborative learning groups with sensitivity to this factor.

Collaborative learning accommodates the tenets of the theories of cognitive-developmental, behavioral and social interdependence [2]. It has been already proved by many researchers that group learning can lead to academic success of students [3]. In our current study, small virtual groups were formed to enable students' to actively participate in collaborative work. One of the aims of our experimental technology mediated framework was to find out the degree of 'freedom to communicate'. We compared the results of the groups in conventional class room setting with the groups using our experimental framework.

With regard to the impediments to learning caused by linguistic differences between the language of instruction which is English and the students' first language which is Arabic the impact of first language writing orientation was also observed in the study with limited scope.

Organization of the paper is as follows. Methodology is presented in Section 2. Experimental framework is presented in Section 3. Section 4 deals with analysis of experimental results. Limitations and future research are presented in Section 5. Finally, conclusions are drawn in Section 6.

2. Methodology

Any form of pedagogical framework applied would be considered successful if it inculcated the three core forms of learning i.e. learning through thinking, learning through experience and learning through interaction. Technology by itself cannot enhance student learning [10]. We have based our framework on sound constructivist practices that focus on both teaching and technology. In our experimental framework we have blended together the classic style of class room teaching with contextualized collaborative virtual learning. This blend helps to optimize student engagement in collaborative effort and negate the impact of socio-cultural issues on group work. The new services implemented complement the already existing class room based teaching.

In this pedagogical framework students are given an opportunity to be a part of a virtual group which includes a mentor and a senior/ alumni for each of the module (subject) he/she registers. Anonymity of student is maintained by providing each participating student an 'Avatar' of his or her choice. Avatar names are neutral with respect to gender. Identity and role of participants are not disclosed. Use of avatar advocates our proposition of 'freedom to communicate'. Our framework promotes active student involvement by increasing the channels of communication using various synchronous and asynchronous e-learning services spawning an interactive learning environment. This helps them to learn, tutor their peers, receive support and feedback, and continually refine their understanding. Guidance and help from a senior learner (or alumni) enables a

student to understand and solve problems which otherwise would be beyond his/her competence. Knowledge sharing is virtually contextualized by giving the student provision to customize various aspects of their group communication like language, anonymous group leader etc. Pedagogical interventions are based on socio-cultural factors relevant to this study to improve learning outcomes.

Since web 2.0 technologies emphasize user generated content, a culturally sensitive and appropriate monitoring and reporting feature is provided. Guidance through bilingual communication provides a mechanism to build a knowledge base in native language that would be a beneficial resource to the student community. In this pedagogical framework the role of a teacher is to be a facilitator or mentor and the entire process of learning rests on the student. Mentors are required to apply the strategy of immediate acknowledgement and measured response providing students opportunity to solve problems using various communication channels open to them in the framework. Importantly the framework is conducive to carry out assessments that help the mentor to gauge the student performance continuously.

2.1. Technology support

Web 2.0 technologies emphasize on user generated content, data and content sharing, collaborative effort and innovative ways of interacting with various web-based applications [6]. The technologies focus on the use of web as a social platform for generating, repositioning and consuming content. In our framework a number of tools have been provided to enhance student learning experience. The choice of e-learning tools incorporated, aligns with the pedagogy applied. We have observed that students here have readily embraced technology for group interaction. They have shown an inclination to chat and post using their native language while discussing and defining

major module topics. Each tool activated in the framework promotes an appropriate approach to learning. For example chatting was limited within each virtual group while discussion forums were configured for intergroup communication, this promoted collaborative learning and also learning by teaching as we noticed that students approached common forums when a particular problem could not be solved within the group. Mentors progressively provided relevant exercises to engage students in the use of each tool.

2.2. First language writing orientation

The spatial orientation of Arabic which is the language of the Gulf Region is right to left. The medium of instruction in primary and secondary schools is Arabic. It is observed that students from this region find it difficult to decode the left to right spatially oriented English script. Interestingly, spatial orientation has an impact on reading, writing and other cognitive functions [11]. Hence, it was pertinent in the context of this study to observe the effect on students when they were given an English text in Arabic writing orientation. The aim was to consider the possibility of using the language code known to the students to decipher the new code ie. left to right oriented script.

3. Experimental Framework

The framework was implemented using the popular open source Learning Management System (LMS) for e-learning namely, Moodle and an in-house virtual College Information System (CIS). Students of six different modules with comparable mixed learning abilities from both genders were given access to Moodle using Arabic avatar names. The instructor maintained the mapping of students' avatar names. These were also distributed to alumni and moderators. Students were allowed to choose the language of communication for their discussions. All contents posted by students were monitored and approved by the

moderators. The archived content was used as knowledge base by the students. In all, 35% male students and 65% female students participated in this study.

In order to test the effect of deciphering new code using known code deciphering technique, two pieces of text with similar complexity were prepared; one in normal left to right English writing orientation and the other a mirror image of the English text. The time taken by every student to read each text was observed.

4. Experimental Analysis

Student interaction was analyzed by collecting data from Moodle. In all two hundred and fifty students participated in this study.
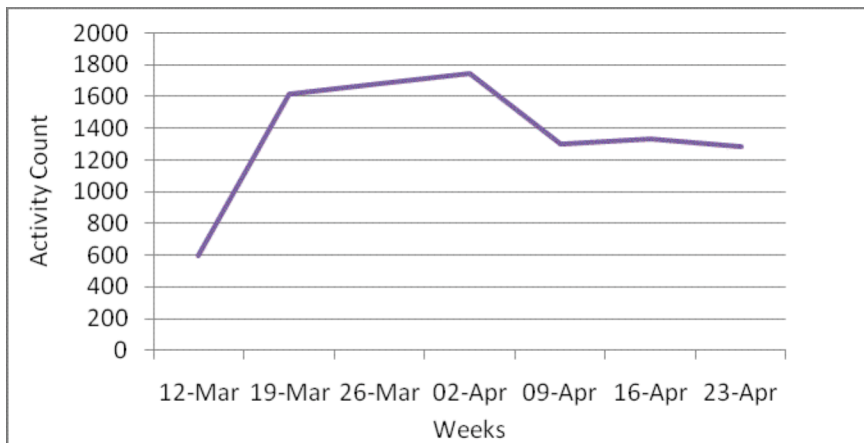

Figure 1. Student activity graph.

Figure 1 shows seven week statistics of student activities excluding chats across modules considered in the framework. It can be seen from the graph that student participation in the first week starting March 12, was low and improved during the

subsequent weeks till the fourth week. However, participation decreased in the fifth week due to commencement of course work assessments particularly in the other modules (subjects) not included in the framework. It remained consistent at the decreased level in the sixth and seventh weeks. It is observed from the graph that students participated actively in the virtual environment.

4.1. Student Performance

Correlation and t-tests were conducted on student performance in the modules. Performance of cohorts of students with similar profile exposed only to conventional delivery method has been compared with the performance of similar profile students using the new framework. One module corresponding to each undergraduate course level [12-13] was chosen to represent students at various levels. It is pertinent to note that of the six modules selected, modules 5 and 6 had a skewed gender distribution. There were significantly more female students in both cohorts using the framework and the compared cohorts where the delivery method was conventional.

Average percentage mark and t-test results are given in Table 1. The average percentage mark was computed by evaluating students' academic performance in their respective modules. A positive correlation (0.86) is observed between the academic performances of the groups compared. This shows that improvement in academic performance across all the modules considered is consistent.

The hypothesis for t-test analysis is defined as 'there is no difference between the scores of the two compared groups.'

It is evident from Table 1 that t-test values of module 1, module 2, module 3 and module 4 are greater than their

respective critical values. Hence, the hypothesis is false for these modules. However, in the case of modules 5 and 6 the t-test values are less than their critical values and hence the hypothesis holds true for modules 5 and 6. In the case of these two modules improvements have been marginal. This can be attributed to the fact that the gender distribution within the cohorts was skewed.

Table 1. Student academic performances in six modules of different complexity levels. Average percentage mark is shown in the table.

		Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Without Frame-work		47.01	60.32	57.64	68.5	55.66	67.55
With Framework		60.39	74.85	70.46	75.53	69.75	71.58
t -test Result	t Stat	2.23	2.82	1.91	1.90	1.50	0.49
	t Critical value	1.67	1.68	1.72	1.72	1.83	1.80
	p–value	0.015	0.004	0.035	0.036	0.084	0.32

Since the gender details were concealed using avatar names, students collaborated and interacted freely. Thus avatar names are the fundamental reason for 'Freedom to communicate' in this framework. It is found from student feedback that they favor the current framework primarily due to its anonymity factor.

4.2. Script Orientation

It was observed that 16% of the students could read the mirror image of English text faster than they read the normal left to right oriented English text. This confirms the findings of similar preliminary experiments conducted on Arabic students [4]. However, the impact of this on learning needs to be explored further in future studies, taking into account past exposure of students both to English and Arabic language.

5. Limitations and Future Research

Feedback from this study will be used to enhance the framework. Findings suggest a very positive attitude of students towards the initiative. While the right to left orientation of Arabic does influence the pace of reading a text in English, it requires further detailed scientific investigation to determine its impact on learning and comprehension.

6. Conclusions

Since student participation in mixed gender group activity cannot be enforced in traditional class room setting it is evident that student collaborative learning and academic performance can be optimized by technology assisted contextualized collaborative learning environment. This paper describes such a framework developed at the Middle East College of Information Technology (MECIT), Sultanate of Oman. The paper concludes with some future research directions about effective contextualized technology mediation that could be implemented in the Gulf Region.

7. Acknowledgements

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