Using Principles of Activity Theory to Design Online E-learning Modules Supported by Cooperative Learning Activities on the Blackboard System

MAHMOOD AHMED HASAN
Office of Institutional Research
Qatar University
P.O.Box 2713, Doha
QATAR
Email:mahassan2003@yahoo.com

Abstract: - This research aims to design online e-learning modules supported by cooperative learning activities on the Blackboard System using principles of Activity Theory and also aims to investigate the impact of e-learning supported by cooperative learning on students’ communication skills. E-learning modules were developed by the researcher and delivered through the Blackboard system (BB) at Qatar University, State of Qatar. The communication skills questionnaire were developed and administered to four groups of the Arabic Language (1) before and after the treatment. A quasi-experimental design was used and a 2 X 2 factorial analysis was applied in this research to examine the main effect of e-learning with cooperative learning (ELCL) mode and individual e-learning (IEL) mode as well as the main effect of the gender as a moderator variable, on the level of students’ communication skills. The sample consisted of 170 undergraduate students from different majors at Qatar University. Descriptive and inferential statistics were used to analyse the quantitative data collected. The findings of this research showed that students using e-learning modules with cooperative learning (ELCL) attained significantly higher adjusted mean of the post-test scores on the perceptions of communication skills than students using individual e-learning modules (IEL). There is no significant difference between the male and female students on adjusted mean of the post-test scores on the communication skills. Also, there is no significant interaction effect between e-Learning modes (EL) and gender on the communication skills.

Key-Words: - E-learning, Cooperative learning, Blackboard System, Activity Theory, communication Skills

1 Introduction

Using e-learning ensures achieving objectives in lesser time and effort [1]. Strategies used in the traditional classroom setting, such as cooperative learning, can be used to create effective learning and an active learning environment for online learning [2]. There are many types of cooperative learning strategies that can be used in an online environment, such as role playing, simulations, students team achievement division(STAD), case studies, forums, small group projects, jigsaw activities, blogs, virtual teams, debates, learning contracts, self-directed learning, three-step-interviews, learning together, talk pair and inside-outside circle [2], [3].

Based on the social-constructivist view, cooperative learning is a constructive process during which students’ co-construct knowledge and meaning while interacting with peers, instructor, tools, and content [4]. In addition, learning is a social activity, and students learn better when they interact frequently with teachers and peers[5]. Thus, an e-learning system provides tools that support various kinds of student-instructor and student-student interactions that allows learners to interact by providing synchronous and asynchronous communication tools thus supporting social construction of knowledge [6].

Communication skills is a vital part of any individual as the basis for exchanging information. People spend more time in communicating than anything else: talking, listening and interacting with others (7). According to [6] communication is essential to our personal, professional, and civic lives. The need for effective communication tends to be increasing due to globalization, science, technology and trade. It is essential for the next generation to be well equipped with the basic skills of communication because of the enormous requirement for competency in the digital society.
today. In the digital era, students are expected to acquire communication skills to demonstrate their abilities in their career and instructional institutions should take into account the best way to develop students’ communication skills [8].

One of the most popular theories in designing e-learning supported by cooperative learning is Activity Theory [6] and it emphasizes that human practices are all associated with individual level as well as with social level [9]. According to [10] an activity includes a subject and a community element; while the subject can be an individual or a group engaged in an activity, the community element represents the collective group and those people who interact with the individual (subject) or shared interest in the object and outcomes of the activity. All members of community have roles (i.e., division of labor); all act within a certain set of rules; and all use tools in order to work on the object to achieve the learning outcomes. The mediation includes the use of many different types of tools, e.g. material tools as well as psychological tools, including culture, ways of thinking and language. E-learning tools, which can be used, are such as online discussion forum, blogs and group work [11]. Figure 1 shows the different components of an activity system.

![Figure 1 Engestrom Model of A Human Activity System [10]](image)

To integrate the various requirements of e-learning modules design, the researcher used the activity theory to analyse cooperative learning online. The researcher applied the activity theory elements for ELCL as follows:

Subject: Arabic Language (1) students who work on the e-learning modules.

Mediation Tool: Resources: lecture captured session, Video clips, Multimedia and the content of the e-learning modules.

Technical tools and environments: The BB system and computers.

Supports: Video clip to guide student How to study the EL modules via BB system.

Community: Composed of instructors, Students as groups, IT technicians and learning system coordinators.

Division of labour: Roles of Instructors: design the tasks. Create the roles, moderate the interaction. Evaluate the products of students. Give feedback.

Role of students: solve the tasks. Post the task on the discussion board, Evaluate the work of other groups.

Rules: Deadline for doing the task, Criteria of evaluation, Criteria to advance to the next module (90% on post-test).

Object: Acquiring knowledge and skills as a result of studying e-learning modules on the BB and completing the activities.

Learning outcomes: Through the interaction between all elements of the system, the object will transfer to learning outcomes which is improvement of achievement as measured by achievement test and communication skills as perceived by students (measured by questionnaire).

2 Problem statement

Core curriculum Program at Qatar University used an indirect assessment tool, the Student Feedback Questionnaire, to estimate the level of achieving the communication skills as perceived by students. This tool is administrated at the end of each semester [12]. In 2008-2009 academic year, the achievement level of communication skills did not meet the desired key performance indicator. The results show that only 71% of students perceived the level of achieving the learning outcomes on communication skills to be at the Large Extent. The target was 80% or higher.

In light of this result, it was recommended that action plan should be taken to increase the percentage of student acquiring the communication skills at the desired level [12]. One of these actions is using the E-learning modules supported by cooperative learning strategies. In view of the gap, the researcher sought to design e-learning modules using the BB system effectively in such a way to help increase students' communication skills and to
investigate the impact of e-learning modules with cooperative learning on QU communication skills.

3 Objective of the research
There are two objectives of this research:
1. Evaluating the impact of e-learning modules on communication skills as perceived by students
2. Identifying the interaction effects between the e-learning modes and gender on communication skills as perceived by students.

4 Research hypotheses
H1: Students using e-learning modules with cooperative learning (ELCL) mode will attain a significantly higher adjusted mean score on the perception of communication skills (PCS) than students using the individual e-learning modules (IEL) mode, that is PCS_{ELCL} > PCS_{IEL}.

H2: Female students using e-learning module will attain a significantly higher adjusted mean score on the perceptions of communication skills (PCS) than male students using the same modules regardless of e-learning modes, that is: PCS_F > PCS_M.

H3: There is a significant interaction effect between the e-learning modes (ELCL & IEL) and gender on the perceptions of communication skills.

5 Method and Procedures
This study uses a quasi-experimental research. The researcher used the 2 X 2 factorial design to examine the main effect of e-learning approach as an independent variable which has two levels: e-learning with cooperative learning (ELCL) mode and individual e-learning (IEL) mode as well as the main effect of gender as a moderator variable which has two levels (male & female), on students’ perceptions of communication skills as a dependent variables. The 2 X 2 factorial design also was used to examine the interaction effects between the e-learning approach (EL)and gender.

four experimental groups were used: Experimental group (1) consisted of male students who were taught using e-learning with cooperative learning; Experimental group (2) was a group of female students who were taught using e-learning with cooperative learning; Experimental group (3) consisted of male students who were taught using individual e-learning and Experimental group (4) consisted of female students who were taught individual e-learning.

The courseware (five e-learning modules) was developed for the Arabic Language (1). The sample of 170 students involved in this research consisted of students within the age group ranging from 20 to 22 years and represents 37.7 % of the total number of students who registered for the Arabic Language (1). All 170 students were taken from four normal sections without any changes. Two of the sections (female students) were located at the female campus while the two male sections were located at the male campus. This is due to the gender segregated education system of the University of Qatar.

In this research, four types of cooperative strategies were used online by students on the BB system. These strategies are: small groups, jigsaw, think-pair-share and debate. The Communication Skills Questionnaire (CSQ) was developed by the researcher. It contained 24 items divided into three categories: listening skills (6 items), speaking skills (9 items), and writing skills (10 items). The items of questionnaire were estimated on a scale of 1–5. The instrument was given to four experts on the fields of Curriculum, Educational Technology, and Evaluation for validation. Based on the pilot study, the statistical reliability of the instrument was assessed using Cronbach's alpha coefficient. The analyses produced a 0.92 coefficient alpha value for the whole instrument, 0.811 for listening skills, 0.802 for peaking skills, and 0.82 for writing skills.

6 Findings
To test the three hypotheses, the Two-way ANCOVA technique was used to identify the three effects (two main effects and one interaction effect). The main effect of the independent variable is the e-learning mode (ELCL compared to IEL). The other main effect, which is the moderating variable, is gender (Males versus females). The third effect is the interaction effect for both the variables (e-learning modes and genders).

To reduce the statistical error, the pre-test scores was used as the covariate variable and a comparison was made between the two groups (ELCL versus
IEL), males versus females and the Interaction effect using the Two-way ANCOVA procedure (Table 1).

Table 1 Summary table of the two way of analysis of covariance (ANCOVA) results by e-learning modes and gender for communication skills.

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>2190.1</td>
<td>4</td>
<td>547.53</td>
<td>8.58</td>
<td>0.00</td>
</tr>
<tr>
<td>Intercept</td>
<td>4614.30</td>
<td>1</td>
<td>4614.30</td>
<td>72.26</td>
<td>0.00</td>
</tr>
<tr>
<td>Pre test</td>
<td>1344.72</td>
<td>1</td>
<td>1344.72</td>
<td>21.06</td>
<td>0.00</td>
</tr>
<tr>
<td>e-learning mode</td>
<td>592.58</td>
<td>1</td>
<td>592.58</td>
<td>9.28</td>
<td>0.00</td>
</tr>
<tr>
<td>Gender</td>
<td>80.433</td>
<td>1</td>
<td>80.43</td>
<td>1.26</td>
<td>1.00</td>
</tr>
<tr>
<td>e-learning mode</td>
<td>*</td>
<td>1</td>
<td>24.66</td>
<td>0.39</td>
<td>0.45</td>
</tr>
<tr>
<td>Error</td>
<td>10535.76</td>
<td>165</td>
<td>63.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1616721.00</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To test hypothesis one, comparison was made between the groups using ELCL mode and the groups using IEL mode based upon the adjusted mean score of the post-test communication skills (Table 1). The adjusted mean of post-test scores for the group using the ELCL is (98.84) with standard error (0.768) and the adjusted mean of the post-test score for the group using the IEL is (95.42) with standard error (0.768), which is lower than the ELCL group.

Table 2 Means, standard deviations, adjusted mean and standard error for post-test scores of students’ communication skills in various treatment groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Adjusted Mean</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL + C</td>
<td>85</td>
<td>99.25</td>
<td>8.393</td>
<td>98.838**</td>
<td>.768</td>
</tr>
<tr>
<td>EL – C</td>
<td>85</td>
<td>94.98</td>
<td>8.462</td>
<td>95.423*</td>
<td>.768</td>
</tr>
<tr>
<td>Total</td>
<td>170</td>
<td>97.135</td>
<td>8.677</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The two-way ANCOVA result, as shown in Table 1, indicates that the main effect of EL modes (ELCL & IEL) on the students’ communication skills is statistically significant at the 0.05 level (F(1,68)= 9.84; p= 0.002). Since the adjusted mean of ELCL (98.838) is higher than the adjusted mean of IEL (95.423) as shown in table (2), then it can be concluded that the ELCL is more effective on developing communication skills than IEL. Accordingly, hypotheses (1) “Students using the e-learning modules supported by cooperative learning ELCL mode will attain a significantly higher adjusted mean score on the communication skills than students using e-learning modules without cooperative learning IEL mode” is accepted. With respect to the effect size, the \( \omega^2 \) value being the estimate of effect size reached = 0.36. According to criteria set by [13], the values of \( \omega^2 \) show that there is a large effect of ELCL on students’ communication skills.

To test hypothesis two, a comparison was made between the male and female groups of students, regardless of their e-learning mode, based upon the adjusted mean of the post-test scores on communication skills. Table 10 showed the difference between the adjusted mean of the post-test scores for male and female students. The adjusted mean of the post-test scores for male students was (97.129) with standard error (0.767), while the adjusted mean of post-test scores for female students was (97.132) with standard error (0.767). This showed that the male students’ communication skills are equal to the female student’s communication skills.

Table 3 Means, standard deviations, adjusted mean and standard error for post-test scores on students’ communication skills based on gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Adjusted Mean</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>86</td>
<td>97.5</td>
<td>8.6</td>
<td>97.1a</td>
<td>.77</td>
</tr>
<tr>
<td>Female</td>
<td>84</td>
<td>96.8</td>
<td>8.7</td>
<td>97.1a</td>
<td>.77</td>
</tr>
<tr>
<td>Total</td>
<td>170</td>
<td>97.1</td>
<td>8.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The two-way ANCOVA result, as shown in Table 8, indicates that the main effect of gender on the students’ communication skills is not statistically significant at the 0.05 level (F(1,68)= 0.000; p=0.998). Since the adjusted mean of males (97.129) is approximately equal to the adjusted mean of females (97.132) as shown in table (3), then it can be concluded that that there were no significant differences in overall communication skills between male and female students when they were exposed to the e-learning modes. Accordingly, hypotheses (2) “Female students using e-learning modules in general will attain a significantly higher adjusted mean score on the
communication skills than male students using the same modules” is rejected.

**Testing hypothesis three**, Table 4 presents the means and standard deviations of each post-test scores and the interaction effect between e-learning modes (ELCL & IEL) and gender. For groups using ELCL mode, the male students had a reported adjusted mean of 99.14 with a standard error of 1.396 while the female students had a reported adjusted mean of 99.44 with a standard error of 1.380 for communication skills. For groups using IEL, male students had a reported adjusted mean of 97.25 with a standard error of 13.64 while female students had a reported adjusted mean of 93.801 with a standard error of 1.413 for communication skills.

Table 4 Means, standard deviations, adjusted mean and std. error for post-test score of communication skills based on el modes and the gender

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Adjusted Mean</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>43</td>
<td>99.44</td>
<td>8.16</td>
<td>99.44</td>
<td>1.38</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>85</td>
<td>99.29</td>
<td>8.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL – C</td>
<td>Male</td>
<td>44</td>
<td>95.86</td>
<td>8.36</td>
<td>97.25</td>
<td>1.36</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>41</td>
<td>94.07</td>
<td>8.56</td>
<td>93.80</td>
<td>1.41</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>85</td>
<td>94.97</td>
<td>8.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Covariates appearing in the model are evaluated at the following values: pre-communication skills = 85.70.

To examine the interaction effect of EL modes (ELCL & IEL) and gender, on communication skills, Two-way ANCOVA was conducted as shown in table 8. The two-way ANCOVA result, as shown in Table 8, indicates that the interaction effect of EL modes (ELCL & IEL) and gender on the students’ communication skills is not statistically significant at the 0.05 level ($F_{(1.66)} = 0.575; p=0.449$). Accordingly, it can be concluded that H3: There is an interaction effect between the e-learning modes (ELCL & IEL) and gender on the student communication skills is rejected.

In other words, in each e-learning mode, male and female students benefited equally in developing their communication skills; thus, the impact of EL modes on communication skills is not affected by gender. Figure 5 shows that in each mode, male and female students benefited equally.

Figure 2 Adjusted means of post-test score of communication skills based on el modes and gender.

Figure 2 shows that male and female students benefited equally in their communication skills in each mode.

**7 Conclusion**

Apparently, the various features available in the ELCL mode such as, diversity of communication tools available on the BB system, more guidance and supervision from peers and facilitator, a great variety of internal and external resources, diversity of cooperative learning strategies that may met the learning styles of students; more interaction and participation on the discussion board were able to significantly improve the achievement and the communication skills. In conclusion, the principles of Activity Theory and Social Constructivism Theory need to be considered in designing e-learning-based cooperative learning activities in order to promote language learning and communication skills.

**References**


[8] R. J. Hollandsworth, The theoretical and practical considerations for effective design, development and evaluation of an asynchronous review module on interpersonal communications. Doctoral Dissertation, Faculty of the Virginia Polytechnic Institute and State University. USA, Pro-Quest Information and Learning Company, 2005. UMI Number: 3255313


