



E-learning modules supported by cooperative learning: Impact on Arabic language achievement among Qatar University students

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ABSTRACT

This research aimed to investigate the impact of e-learning supported by cooperative learning on students' achievement in the core Arabic language course (ARAB100) delivered through the Blackboard system at Qatar University, State of Qatar. The *activity theory* was the basis for the design of the study which employed a 2×2 quasi-experimental factorial design to investigate the interaction between the independent variables of the research: e-learning supported by cooperative learning (EL + CL) and e-learning not supported by cooperative learning (EL – CL) with gender as a moderator variable and achievement in the Arabic language as a dependent variable. An achievement test was developed and administered to a sample of 170 undergraduate students (85 male and 85 Female) majoring in different subjects from seven colleges of the University over a 10-week period. Analysis of the findings by the two-way ANCOVA procedure was used to examine the three postulated hypotheses. The findings of this study showed that students assigned to the e-learning modules supported by cooperative learning (EL + CL) mode attained significantly higher adjusted mean scores on Arabic language achievement than students working on the e-learning module that were not supported by the cooperative learning (EL – CL) mode. Male students attained significantly higher adjusted mean scores on the achievement test than females using the same modules. No significant interaction effect was detected between e-learning modes and gender on achievement. In conclusion, the principles of the activity theory need to be considered when designing e-learning modules supported by cooperative learning activities in order to promote Arabic language learning.

Keywords: e-learning, cooperative learning, activity theory, language development and teaching with technology in higher education

<http://dx.doi.org/10.5339/nmejre.2012.1>

Submitted: 27 July 2011

Accepted: 1 April 2012

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INTRODUCTION

E-learning systems are increasingly being integrated into universities as a new means of learning and teaching.¹ E-learning systems have many advantages to support learners using multimedia systems however, the effective use of these systems are rarely given much consideration by faculty members in universities.² Ismail³ found that faculty members at Qatar University (QU) upload content online without applying any sound pedagogical principles to the design of e-learning.

In 2008 Qatar University's Strategic Objectives stated the planned increase of information and communication technology (ICT) in teaching and learning. Accordingly, measures were taken by QU to adapt the Blackboard (BB) system as a university-wide system for managing and delivering academic courses. To encourage QU faculty to use the BB system effectively, annual awards were initiated in 2008 for members who successfully utilized features of the BB system to deliver their courses. It was noticed by the researcher that the rate of BB usage at Qatar University (QU) increased gradually each semester as a result of the new measures taken however, it was still felt that the majority of courses did not utilize all the available features such as the communication tools.

From the researcher's perspective, focusing on using e-learning systems to deliver individual learning without incorporating interaction and cooperation among students is likely to only encourage individual working habits rather than cooperative working habits. Consequently, difficulties may be faced by learners when joining others in cooperative tasks due to under-developed interpersonal skills. Recent efforts by QU have focused on preparing students to work cooperatively with their peers and develop the necessary skills for critical thinking and effective communication. Faculty members assess these skills through different methods and tools, such as achievement tests, homework, in-class activities, presentations and projects, which help to increase the learning gains of students as reflected by their Grade Point Average (GPA).

One of QU's policies is that students whose grade point averages (GPA) fall below 2.0/4.0 for one semester are placed on probation for the following semester; three consecutive semesters with grades averaging below 2.0 results in a student's suspension from the university.⁴ According to the Institutional Research Office, an average of approximately 591 out of 7923 students received warnings per semester for GPAs below the accepted level (7.5%). The average of warnings for male students was 160 out of 1712 per semester (9.5%) and the average for female students was 431 out of 5806 (7.4%). Such figures have indicated that the achievement of male students has been less than the achievement of females, which suggests that gender is a factor to consider when cooperative learning activities are used as a technique to promote e-learning.⁵

Theoretically, cooperative learning requires the exchange of ideas and opinions with all participants. Gender-related differences are evident in cooperative online learning in terms of language styles, conversational behavior and participation patterns.⁶ Herring⁷ asserted that men's language tends to be more assertive and challenging. It is often self-promoting, authoritative, including presuppositions and rhetorical questions, with humor and sarcasm. In contrast, women's language tends to be more tentative and includes apologies, justifications and questions. Overall, women's language is more personal and supportive of others.

Graddy⁸ found that in the case of conversational behavior of male online postings, the tone is more optimistic than that of female postings. Female conversations were found to use words that reveal social isolation and the rejection of social constraints when participating in electronic media where their identities were concealed. Opposite findings have also been reported. Davidson-Shivers et al.⁹ found that contributions to computer-mediated communication (CMC) settings e.g., online bulletin boards are equal in amount in gender. These mixed findings suggest that gender differences have the potential to affect online interaction. In analyzing interaction participation patterns, Hsi and Hoadley¹⁰ found that females participated more than males in electronic discussions and reported feelings less often. It remains unknown whether gender and cooperation in e-learning environments may interact to impact student achievement and communication skills.

Few studies to date have investigated the benefit of e-learning and cooperative learning combined in education in the Middle East. In particular studying the impact of this mode of learning on Arabic Language achievement is of importance due to the reported low achievement of students in Arab language. Mhailan¹¹ studied the effects of field specialization, year of study, nationality and gender on Arabic spelling skills amongst students at the University of Jordan. Weaknesses were found in grammar and spelling amongst students, with statistically significant differences in the mean scores of students with regards to their field of specialization, acceptance program, nationality and gender.

In spring 2008, the average of achieving the learning outcomes of the core Arabic language course (ARAB 100) at QU showed that only 53.3% of students enrolled in this course felt they achieved the learning outcomes from a large extent to a very large extent of the Likert scale. This finding did not meet the desired key performance indicator (benchmark), which was set at the 80% level. In light of these results, it was recommended that corrective actions be taken to increase the percentage of students achieving the learning outcomes of Arabic language (ARAB100) to target levels.¹²

This research was therefore designed to study the impact of using e-learning supported by cooperative learning on the Arabic language achievement of students at QU, by utilizing features of the BB system, specifically its communication tools, to support cooperative learning. It is believed that by implementing the strategy of cooperative learning, learners will have the opportunity to experience multiple perspectives of other learners from different backgrounds and develop critical thinking skills through the process of judging, valuing, supporting, or opposing different viewpoints,¹³ which may contribute to an increase in achieving learning outcomes. The researcher intends to use the findings of the study to design e-learning modules supported by cooperative learning activities using the BB system, which may help in increasing students' achievement in the Arabic language course (ARAB100).

HYPOTHESES

The purpose of the study was to test three hypotheses:

1. To investigate the impact of e-learning modules supported by cooperative learning on QU students' achievement in the Arabic language course (ARAB100).
2. To investigate the impact of e-learning modules on male and female students' achievement in the Arabic language course (ARAB100).
3. To investigate the impact of interaction between the e-learning modes supported and not supported by cooperative learning and gender on students achievement.

The level of significance (alpha) in this study was set at 0.05. Based on the literature reviews,^{14–20} the alternative directional hypotheses were tested:

- H1: Students using e-learning modules supported by cooperative learning (EL + CL) mode will attain significantly higher adjusted mean scores (X) on the achievement than students using the individual e-learning modules (EL – CL) mode.
- H2: Female students using e-learning modules will attain significantly higher adjusted mean scores (X) on the achievement outcomes than male students using the same modules regardless of e-learning modes.
- H3: There is significant interaction between the e-learning modes (EL + CL; EL – CL) and gender on achievement.

THEORETICAL FRAMEWORK

The researcher designed online learning modules for the Arabic language course (ARAB comprising five units, following the 'activity theory' of Engestrom.²¹ The activity theory considers a wide range of factors that interact and have an impact on an activity. The theory is composed of a subject which deems that as an individual or group engages in an activity, the community interacts with the individual. The framework accounts for all roles in an activity, the rules that affect an activity and the tools in order to achieve the objectives. The activity is mediated by different types of tools, e.g. material tools as well as psychological tools, including culture, ways of thinking and language. The types of tools that can be mediated for e-learning are online discussion forums, blogs and group work.²²

The activity system shown in Figure 1 is a way of visualizing the total configuration of an activity.

The conceptual framework of the study (Figure 2) was based on the model presented in Figure 1. The designing and delivering of e-learning modules (the treatment material) was considered to be the *objective* of the study to provide students with the necessary information, skills and awareness to be able to collaborate in the development of knowledge. The dependent variables, which included achievement in Arabic language and communication skills, were considered the *learning outcomes*. Male and female students were the *subjects*. The impact of the independent variable, e-learning modules supported and not supported by cooperative learning delivered via the BB and various other means including email, discussion boards, forums and whiteboards were considered the *tools*. The *community* was the interaction between student–student, student–instructor,

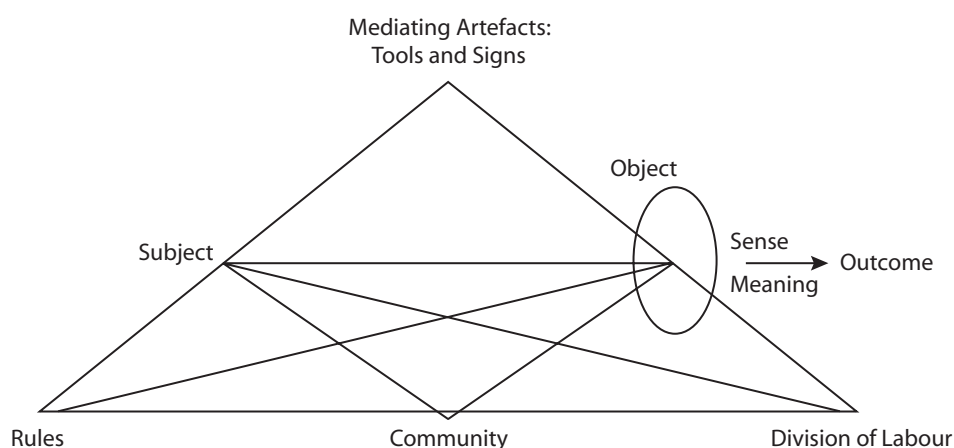


Figure 1. Engeström model of the human activity system (²¹, p. 78).

students – e-learning modules. The division of labor determined the *roles* taken by students, instructors and administration. Finally, the rules regulated the use of time, the online behaviors, the measurement of outcomes and the criteria for rewards. Figure 2 concentrates on the feedback through the relationship between all the elements of the activity theory.

A number of researchers have adopted the activity theory in language learning studies to demonstrate how this conceptual framework can bring new insights into language development. Among these researchers are,^{19,23,24} whom directly explored the implications of activity theory for language development. This approach offers a more complex and nuanced picture than standard research practices, allowing the researcher not only to describe, but also to explain, the various phenomena involved.

Wen¹⁹ reviewed a number of studies that used activity theory as a lens through which to study and better understand language development. He pointed out in his study the assumption that students who are more engaged in tasks are consequently more oriented to the goal of learning a language if they find it intrinsically interesting.

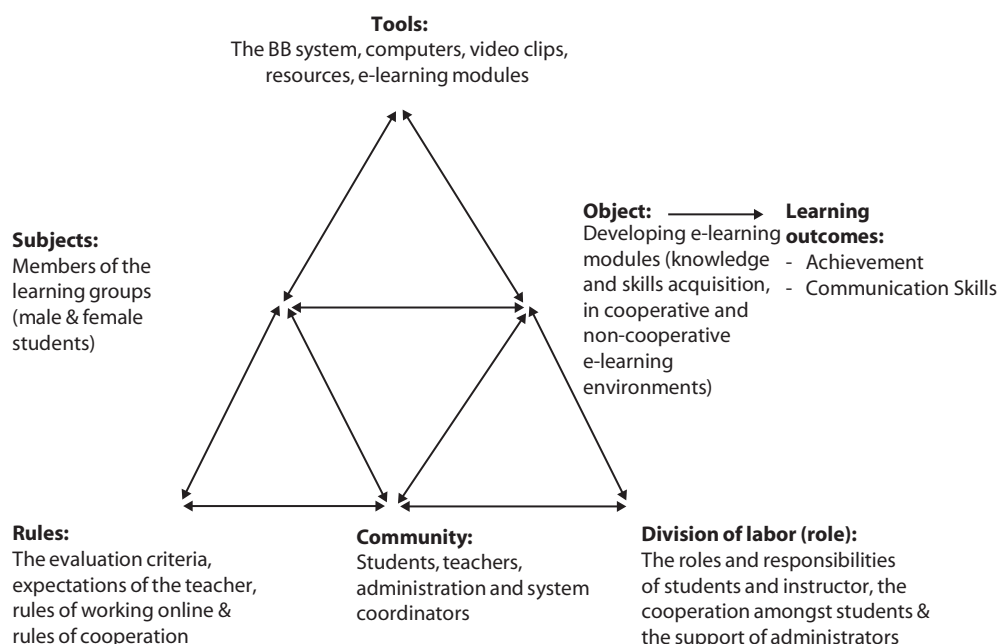


Figure 2. Conceptual framework of the research, modified from Engeström Model (1987).

Table 1. Research design, 2 × 2 factorial design.

	E-learning approach	
Gender	(EL + CL) Mode	(EL – CL) Mode
Males	Group (I)	Group (III)
Females	Group (II)	Group (IV)

METHODOLOGY

The study employed a quasi-experimental design as randomization of students to treatment groups was not possible. Although the quasi-experimental design assumed the absence of a control group, the pre-test post-test control method was used, as pre-test scores taken were considered the covariate variable for the post-test scores of the achievement. This helped to account for any differences that may have existed before the onset of the study, as well as ensuring the homogeneity and coherence between the groups, which was important for validating the results.²⁵

The interaction effects between e-learning modes and gender were examined by a 2 × 2 factorial design. This experimental design enabled the comparison of the main effects of the e-learning approach as an independent variable having two levels: e-learning with cooperative learning (EL + CL) and e-learning without cooperative learning (EL – CL), with the effect of gender as a moderator variable also with two levels (male and female) on the level of achievement as a dependent variable. Table 1 illustrates the research design.

A sample of four out of ten Arabic 100 course sessions were randomly selected for participation in the study over a 10 week period of the Spring 2009 semester. Two male and two female groups were assigned randomly to the e-learning modes to ensure equal gender distribution. The participating groups were located at two separate campuses due to the gender segregated education system at Qatar University.

The sample consisted of 170 out of 450 students, which represented 37.7% of the total number of students that were registered for the Arabic language course. Students within the age group ranging from 20 to 22 years of age were involved in the study.

The research design with the treatments and instruments involved are illustrated in Table 2.

The treatment materials in this study were based on the content of the course Arabic language (ARAB100) as a core curriculum program (CCP) required for all undergraduate students at QU. The goal of the course is to provide students with Arabic language skills, in reading, listening, speaking and writing. This course was selected as it is a university-wide core curricula program, mandatory for all students regardless of their major. Faculty members teaching CCP courses are encouraged to incorporate technology in the delivery of their courses wherever possible.

The main purpose for designing and developing the e-learning modules is to create better interactivity, collaboration and communication in an e-learning environment that will support student achievement. Students enrolled in this course receive instruction in a blended format that includes face-to-face meetings and online instruction. The BB system (version 9) is used to deliver course content and track students' activities and progress. The BB system also serves as a communication tool between the instructor and students. Students can use the discussion board forums, visual class and the email tools to discuss assignment questions or tasks with their peers and instructors.

Different instructors teach the various course modules across the BB using the same course content, syllabus, assignments and exam questions. The BB tools such as syllabus, course content, calendar,

Table 2. Research design with the treatments and instruments involved.

EL + CL → Males → AT + CSQ
EL + CL → Females → AT + CSQ
EL – CL → Males → AT + CSQ
EL – CL → Females → AT + CSQ
EL + CL: E-learning with cooperative learning
EL – CL: E-learning without cooperative learning
AT: Achievement test
CSQ: Communication skills questionnaire

discussion board, email and features for checking students' grades and progress are used by all instructors. During the first class, students were given a 50-minute introductory lecture on the course syllabus requirements and instructions on how to use the BB. Students assigned to the EL + CL mode were divided into groups completing tasks cooperatively using the BB, while students assigned to the EL – CL mode completed the tasks individually.

The design for the treatment materials required five stages as detailed below:

Stage one – The Arabic language coordinator was chosen to assist in determining the appropriate course syllabus and activities, the units to be designed as modules, the learning outcomes of each module and the content of achievement tests.

Stage two – determining topics: The researcher and the language coordinator determined the suitability of topics to be incorporated into the e-learning modules. Five units were selected from the course syllabus that addressed punctuation, conjunctions, common errors in Arabic and listening and reading skills.

Stage three – determining the content of the modules: The researcher in cooperation with the Arabic language coordinator determined the content of modules which included the title, the learning outcomes, pre-test and post-tests, group activities, materials such as PowerPoint presentations and external resources. The incorporation of a wide variety of media was chosen upon including animations, photographs and lecture-captured sessions.

Stage four – design of the e-learning modules: In this stage the e-learning modules were designed based on two main categories: instructional and technical criteria. The instructional criteria was divided into eight subcategories: general information about the course, learning outcomes, the properties of using the modules, content and organization, the strategy of education, learning activities, evaluation criteria and feedback criteria. The second category was the technical criteria, which was divided into six subcategories: written texts, sound and effects, screen stability, picture and video shots, screen design and design of the learning modules for the electronic course. The instructional and technical criteria were used by the researcher when designing the e-learning modules with and without cooperative learning for the five units of the ARAB100 course. These modules were then uploaded onto the BB system.

Stage five – evaluating the e-learning modules: Three experts were invited to review the e-learning modules, a faculty member from the instructional science department, the director of the core program and a faculty member from the Arabic language department. The experts were consulted for their experience using the BB system and designing instructional programs. The experts provided suggestions in improving the design of the e-modules, which was later implemented.

The design of the achievement test (AT) was conducted in a similar manner to that of the e-learning modules:

Stage one – determining the learning outcomes of the modules: The researcher in cooperation with the Arabic language coordinator determined the learning outcomes of each module covering Bloom's taxonomy of cognitive domains (knowledge, comprehension, analysis, synthesis, evaluation, application, understanding and applying).²⁶

Stage two – constructing test items that measure the learning outcomes: The researcher constructed 47 test items consisting of multiple-choice and true and false questions.

Stage three – evaluating the reliability of the AT: The AT was given to a panel of teaching experts for comments on the validity of the test, its content and suggestions on necessary modifications. The final version of the AT was passed to other experts from the educational science department and from the psychological science department for final approval.

For the reliability of the AT to be calculated, the discrimination and difficulty levels were analyzed for each test item. The initial version of the test contained 47 items, seven items were excluded as each learning outcome was measured by more than 3 items. 40 items were still found sufficient to measure the learning outcomes. The internal consistency of the test was estimated through the computation of Kuder-Richardson Formula 20 (KR20).²⁷ The alpha coefficient was found to be 0.81 suggesting that the instrument was suitable for measuring students' achievement (Appendix A).

Stage four – piloting the test: The achievement test was piloted by administering it to 80 students from two Arabic language sections. The students involved in the pilot test were not involved in the actual study. The final test (AT) was administered to all experimental groups in paper-and-pencil format. Students received one score for every correct answer and a null score for an incorrect answer or an unattempted question, with a maximum possible score of 40.

Stage five – assigning the pre- and post-test. In the first week of the study students in each group were given the pre-test. Upon completing the five modules, students were then given the post-test. The interval between the pre-test and post-test was 10 weeks. To avoid the interaction between the pre- and post-test, the achievement questions in the pre-test and post- test were designed to be similar, but were arranged randomly to avoid any possible interaction effect between the two tests.

Each student in the sample were assigned a pseudo name and a password for access to the BB e-learning modules. Two groups (one male and one female) received online-learning with cooperative learning (EL + CL) and the other two groups (male and female) were taught using online learning without cooperative learning (EL – CL). Four faculty members from the Arabic language department (three males and one female) were assigned to teach the four groups for two and a half months, two days a week, 50 min a day. The instructors running the sessions were all experienced in teaching the Arabic language course (ARAB100) and using the BB system. Two different modes of e-learning were given to four different treatment groups as follow:

Students assigned to the EL + CL mode

The two groups assigned to the EL + CL mode studied the e-modules with cooperative learning via the BB system. Students completed the modules by engaging in the cooperative activities discussed below in conjunction with the online communication tools (e.g. discussion board, visual classroom, e-mail). After covering the content of each module students then went on to complete a post-test with a required pass mark of 90% before proceeding to the next module. In this treatment, students were divided into three groups depending on the type of interaction: student-student interaction, student-instructor interaction and student-e-learning modules interaction. The cooperative activities that students were engaged in are as follows:

Small groups: Students were divided into nine groups of five and were allocated their own private online discussion boards with individual passwords. Each group worked on a variety of tasks prepared by the instructor and students communicated amongst themselves through the use of the discussion board, agreeing upon solutions for tasks that were assigned. On completion of the task, the solutions were posted on the discussion board to be evaluated by other group members. The instructor also posted feedback on the discussion board for each group to read, providing feedback and reward. Each group had a leader whose task it was to guide and moderate the group's work.

Jigsaw: In this activity, the groups of five worked on different materials assigned to them by the instructor. Each student was required to gather information from other group members via the BB. Once each group member had gathered the required information they were called 'experts' and were quizzed by their group members in their topic.

Think-pair-share: Groups of two were passed questions and were given time to discuss their ideas and prepare responses. Each group then shared their answers by posting these on the discussion board whereby they could receive feedback from their peers and the instructor.

Debates: Students of four or five in a group were provided a topic and were required to develop a sound line of argument for or against a motion and establish rules in order to keep the debate on topic. The views of the group were then posted on the discussion board and shared with the class.

Students assigned to the EL – CL mode

The students assigned to the EL – CL treatment group were involved in the same activities as those in the EL + CL group however, conversely activities were carried out individually using two types of interactions: student-instructor interaction and student-content interaction. In summary, all the treatments groups used the same e-modules with the same learning materials.

Statistical analysis

To test the three hypotheses a two-way analysis of covariance, ANCOVA technique was used to determine the three effects (two main effects and one interaction effect) on students' achievement at the 0.05 probability level. The main effect of the independent variable was the e-learning mode (EL + CL compared to EL – CL). The other main effect, gender (males versus females) was a moderating variable. Interaction between both variables (e-learning modes and genders) on the level of achievement of students was the third effect considered.

The two-way ANCOVA was chosen for two reasons. The first reason was that the extraneous differences among groups could be controlled after removal of the effects of the covariate (pre-test) from the dependent variables.²⁸ In addition, analysis of covariance adjusts the mean of each dependent variable to what it would be if all cases scored identically on covariates. The differences between groups for covariates were therefore removed so that the real effects of the independent variable could be detected. Secondly, ANCOVA increases the power of an F-test by removing errors associated with the covariate in the dependent variables, thus increasing the sensitivity of the tests in the experimental design.²⁹

A total of 170 cases were available for the univariate analysis of covariance (two-way ANCOVA). Data was evaluated by SPSS for Windows 18.0 to screen for any missing data, outliers and for fulfillment of ANCOVA test assumptions (e.g., exploring the normality of the data, the linearity and homogeneity of variance-covariance matrices). No missing data was detected based on the descriptive statistics performed via frequencies in SPSS.

A preliminary analysis was conducted to assess whether the prerequisite assumptions of ANCOVA were met before examining the univariate statistical outputs. The following assumptions central to ANCOVA in statistical analysis were examined, namely, univariate normal distribution in each group, homogeneity of dependent variable variance matrices across groups in the population, the linear relationship between the covariates and the dependent variables.

Exploring the data

Before conducting the statistical analysis, the assumptions underlying the ANCOVA were tested (i.e. testing for the normality and homogeneity of the data).³⁰ The box plots in Figure 3 showed no extreme cases and no missing values among a total of 170 cases of post-test scores on achievement and communication skills respectively; thus there was no need to remove any cases or transform the data to make the distribution more symmetrical.

Testing the normality of the distribution of post-test scores

Normality is a necessary condition for ANCOVA analysis.²⁵ Normality can be calculated by different methods such as graphical tests e.g. the normally distributed Q-Q plot shown in Figure 4. It can be seen that the Q-Q plot fell along the straight line which indicates that the dependent variables were normally distributed within the groups.

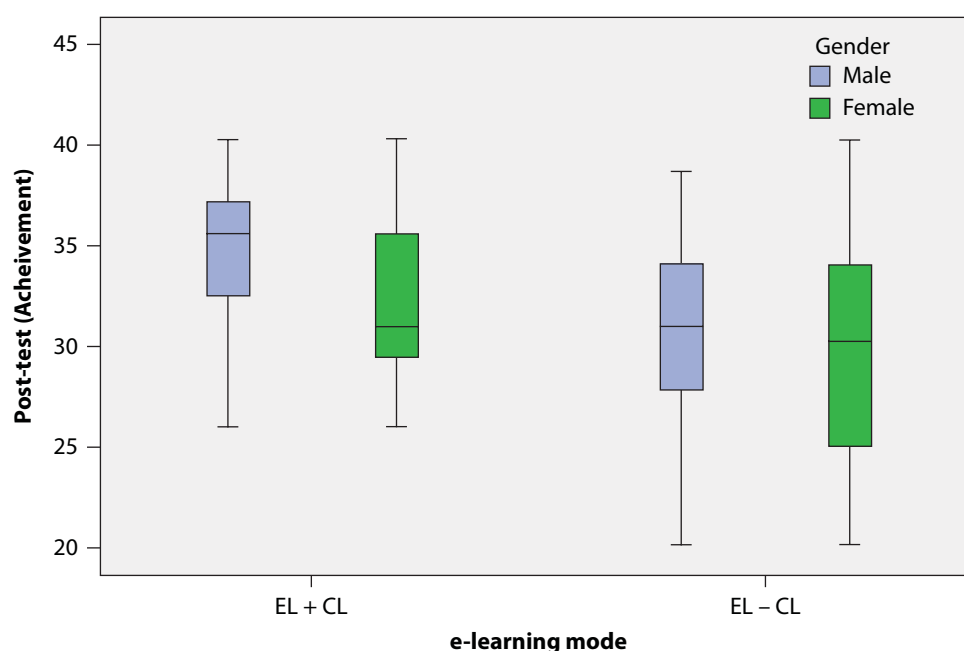


Figure 3. Box plots clustered for post-test scores of achievement of male and female students assigned to e-learning modes with and without cooperative learning.

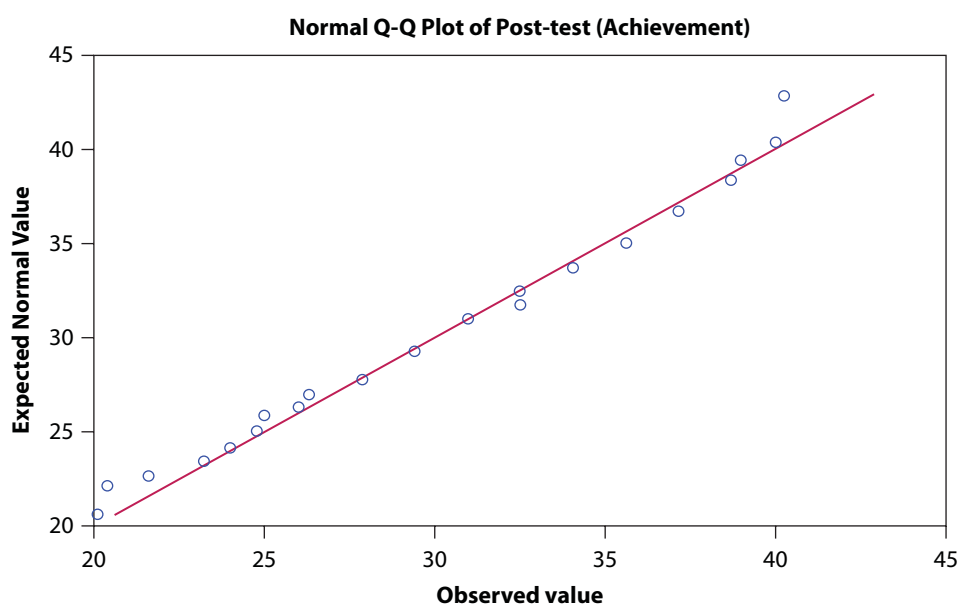


Figure 4. Normal Q-Q plot of achievement.

Testing the homogeneity of variance for dependent variables of post-test scores

The results of Levene's test for homogeneity of variance (Table 3) was conducted by comparing the post-test scores of students across the four groups for achievement and communication skills as dependent variables. Results indicated the homogeneity of variance for all the dependent variables. As such, achievement and communication skills were analyzed by the two-way ANCOVA.

Testing the linearity of the distributed post-test scores

To examine whether the assumptions of the covariate variables had a linear relationship to the dependent variables, Pearson's correlation coefficient technique was used. The results of Pearson's correlation tests indicated that the pre-test scores for achievement (covariate variable) correlated significantly with the post-test scores on achievement. The correlation coefficient $R = 0.618$ indicated a high positive relationship between the pre-test and post-test scores; thus, the pre-test was considered an appropriate covariate.

RESULTS HYPOTHESIS ONE

Hypothesis one stated that at the 0.05 level, students using e-learning modules supported by the cooperative learning (EL + CL) mode would attain significantly higher adjusted mean scores ($\bar{X}$) on the achievement test than students using individual e-learning modules (EL - CL) mode, that is: $\bar{X}_{EL+CL} > \bar{X}_{EL-CL}$.

A comparison was made between the groups based upon the post-test adjusted mean scores of the achievement test (Table 4). A significant difference was detected in the post-test scores for the group assigned to EL + CL (33.33 ± 0.387) in comparison to the post-test scores for the EL - CL group (30.66 ± 0.387).

The correlation coefficient between the pre-test and post-test scores of achievement was calculated ($R = 0.618^*$). This value indicated a high positive relationship between the pre- and post-test.

Table 3. Levene's test of equality of error variances^{a,b}.

Dependent variables	F	df1	df2	Sig.
Achievement test	1.278	3	166	0.284

df: degree of freedom; F: Value of F test; Sig.: significance of F value

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

^aDesign: Intercept + pre-test-achievement + e-learning mode + gender + e-learning mode * gender

^bDesign: Intercept + pre-test-comm. + e-learning mode + gender + e-learning mode * gender

Table 4. Post-test score of students achievement in various treatment groups.

Group	N	Mean	Standard Deviation ($\pm$ SD)	Adjusted Mean	Standard Error ($\pm$ SE)
EL + C	85	33.57	3.828	33.327 ^a	0.387
EL – C	85	30.42	5.248	30.661 ^a	0.387
Total	170	31.99	4.844		

^aCovariates appearing in the model are evaluated at the following values: Pre-test = 8.58

In order to reduce the statistical error, the pre-test scores were used as the covariate variable and a comparison was made between the two groups EL + CL and EL – CL using the two-way ANCOVA procedure as shown in Table 5.

The two-way ANCOVA result indicated that the main effect of the EL modes (EL + CL & EL – CL) on students' achievement was statistically significant at the 0.05 level ($F_{(1,68)} = 23.606$; $p = 0.000$).

The size of the effect (ω^2) of EL + CL on student achievement was calculated and was found to be large (0.441) according to the criteria set by Kinnera and Gray.³⁰ These criteria are: "if ω^2 0.06, the effect size is small; if 0.06 ω^2 0.14 the size effect is medium and if ω^2 0.14, the effect size is large" (p . 281)

Hypothesis two

Hypothesis two stated that at the 0.05 level, female students using the e-learning module in general would attain significantly higher adjusted mean scores (X) on the achievement test than male students using the same modules, that is: $X_{f(EL)} > X_{m(EL)}$.

On comparison of the adjusted mean of the post-test scores for male students and those for female students regardless of the e-learning modes (Table 6), it was found that male students performed better than their female counterparts, 32.73 ± 0.387 and 31.263 ± 0.387 respectively.

To reduce the statistical error, pre-test scores were used as the covariate variable and a comparison was made between the groups of males and females using the two-way ANCOVA procedure. The two-way ANCOVA result, as shown in Table 5 indicated that the main effect of gender on students' achievement is statistically significant at the 0.05 level ($F_{(1,68)} = 7.15$; $p = 0.008$). Since the adjusted mean of males (32.73) was higher than that of females (31.26) as shown in Table 6 it can be deduced that male students attained a higher level of achievement than their female counterparts, which nullifies the hypothesis that females perform better in achievement tests. The size of this effect ω^2 also indicated that the effect of gender on student achievement was large (0.388).³⁰

Hypothesis three

Hypothesis three which tested the interaction effect of EL modes (EL + CL; EL – CL) and gender, on the level of achievement was invalidated. Statistical analysis of the results in Table 7 indicated that the interaction effect of EL modes (EL + CL & EL – CL) and gender on the students' achievement was not statistically significant at the 0.05 level ($F_{(1,66)} = 0.404$, $p = 0.526$).

In other words, there was no significant difference detected between males and females taught via the EL + CL mode on the level of achievement that was attained. Similarly, no significant differences were observed between male and female students taught via the EL – CL mode on the level of achievement, which implied that male and female students both benefited equally from the

Table 5. Summary of the two-way analysis of covariance (ANCOVA) for the results of the e-learning modes and gender on achievement.

Source	df	F	Sig.	Partial eta squared ^a	Observed power ^b
Corrected model	4	36.810	0.000	0.472	1.000
Intercept	1	366.665	0.000	0.690	1.000
Pre-test	1	103.528	0.000	0.386	1.000
e-learning mode	1	23.606	0.000	0.125	0.998
Gender	1	7.157	0.008	0.062	0.758
e-learning mode * gender	1	0.404	0.526	0.002	0.097

df: degree of freedom; F: Value of F test. Sig.: significance of F value.

^aR Squared = 0.472 (Adjusted R squared = 0.459)

^bComputed using alpha = 0.05

Table 6. Post-test scores of students' achievement based on gender.

Gender	N	Mean	Standard Deviation ($\pm$ SD)	Adjusted Mean	Standard Error ($\pm$ SE)
Male	85	32.73	4.851	32.725 ^a	0.387
Female	85	31.27	4.776	31.263 ^a	0.387
Total	170	32.00	4.854		

^a Covariates appearing in the model are evaluated at the following values: Pre-test = 8.58.

instructional methods in each e-learning mode. This also demonstrated that the impact of EL modes on achievement was not affected by gender.

Figure 5 shows that male and female students benefited equally in their achievement in each mode.

DISCUSSION

E-learning modules supported by cooperative learning on Arabic language achievement

Hypothesis one was validated by the study findings as students assigned to the EL + CL mode acquired a higher level of achievement compared to students in the EL – CL group. There are several possible reasons for the significant positive effect of e-learning supported by cooperative learning activities (EL + CL) on Arabic language achievement.

The cooperative learning element meant that students in the EL + CL group worked collectively to complete tasks and were therefore more engaged in the process of learning compared to those working individually in the EL – CL group. Instructors running the EL + CL sessions also helped to encourage students who had fewer posts on the discussion board to participate more in online discussions, which further increased their engagement in the task and enabled them to take away more at the end of each session. These findings are in support of the activity theory²¹ which state that when students engage more in a task and find it intrinsically interesting this results in a higher level of engagement which can yield more positive learning outcomes.¹⁹ This theory is also consistent with more recent findings of many researchers^{31–34} who claim that participants more engaged with a system tend to be more satisfied with the medium and report better achievement.

The higher level of achievement of students that were assigned to the EL + CL mode is also thought to be in part due to increased exposure of multiple and alternative perspectives of other participating students from different disciplines within the university. This idea is also in support of other studies that identify the importance of the peer evaluation process in improving learners' achievement.^{20,35}

Another possible reason attributed to a higher level of achievement of students in the EL + CL group was the collective effort that was required for groups to pass an assignment. This meant that higher-level students supported weaker students to reach shared goals. Vygotsky³⁶ depicts learning as an interaction with more capable peers, helping the learner through the zone of proximal development. The features of the BB system such as the discussion board, chat room and virtual classroom allowed students the opportunity to further support each other in group tasks. These activities provided learners the scaffolding to promote interaction and cooperation between group members, which resulted in rich knowledge transfer developing the group members' individual achievement and enabling them to become experts teaching others in the process.

The effectiveness of e-learning with cooperative language learning highlighted by this study are consistent with the findings reported by many other researchers.^{14–18, 20} A large number of studies have compared computer support cooperative learning (CSCL) in CSCL and non-CSCL environments in

Table 7. Post-test scores of students' achievement based on learning mode and gender.

Learning mode	Gender	N	Mean	Std. deviation	Adjusted Std. error mean
EL + CL	Male	42	34.81	3.747	34.233 ^a
	Female	43	32.35	3.543	32.421 ^a
	Total	85	33.57	3.828	
EL – CL	Male	43	30.69	4.967	31.217 ^a
	Female	42	30.14	5.568	30.104 ^a
	Total	85	30.42	5.248	

^a Covariates appearing in the model are evaluated at the following values: Pre-test = 8.58.

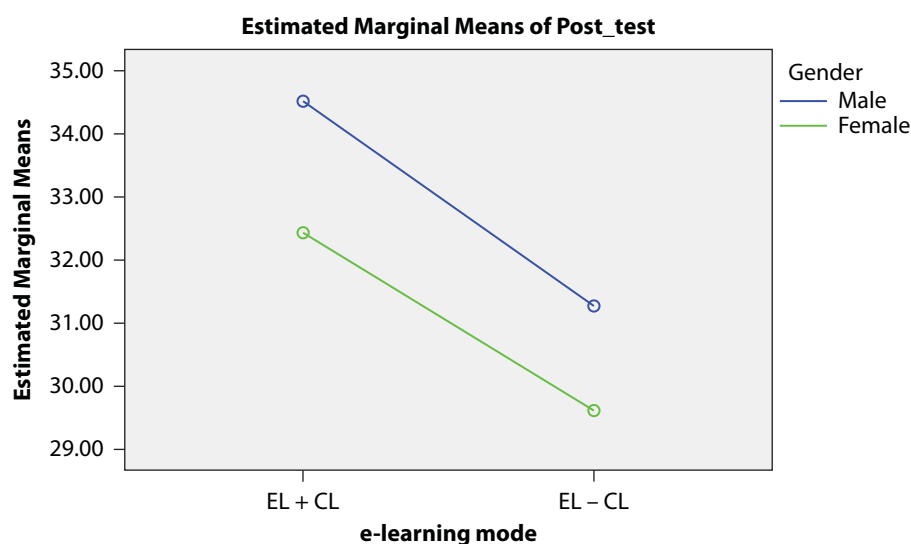


Figure 5. Adjusted means of post-test scores on achievement based on e-learning mode and gender.

university settings, demonstrating that CSCL can achieve better results in terms of student learning outcomes.³⁷⁻³⁹

Other studies however have pointed out some drawbacks of using cooperative online learning.^{40,41} Pragnell et al.⁴⁰ found in their study that constructive online collaboration requires an online instructor to help foster constructive and focused communication so that all students can benefit from cooperative learning.

Gender and Arabic language achievement

Contrary to the predictions, male students outperformed female students using the same e-learning modules. The difference in the level of interaction between students and instructors in the male and female groups is thought to be a factor that has contributed to this outcome.⁴² Typically in Qatar University females are taught by the same gender, in addition to being physically segregated in the learning environment. One of the female study sessions was run by a female and another by a male, whereas both male study groups were run by male instructors. Through the use of statistical tracking features available on the BB, the level of interaction between the instructor and the group of male students was considered to be more than the interaction between the instructor and females.

The activity theory of Angstrom states that increased participation in the learning environment leads invariably to a higher level of achievement. Traditions of the Middle East to an extent dictates the appropriate behavior and attitudes of females everyday life, which may cause barriers in social interaction. These non-physical gender differences that are a product of socialization⁴³ have consequently been observed in teaching and learning.⁴⁴

To remedy the observed gender differences, social constructivism is necessary to provide the support to increase the participation of female students. Support in the form of guidance and reminders may help to increase not only the level of students' participation but also the level of effort that is put into a task.

A difference in the attitudes of male and female students towards e-learning is also thought to have contributed to differences in the achievement levels recorded. Educational technology specialists support this interpretation suggesting that males have more positive attitudes than females in using computer technology to assist their academic learning.⁵ Some studies have suggested that achievement differences between males and females working in an online environment is due to it being a largely male dominated technology until recently.⁴⁵ Recent studies however have shown that differences in using technology and computer literacy levels among male and female students is no longer a significant problem.⁴⁶ Currently the number of females and males who use online education is approximately equal⁴⁷⁻⁴⁹ suggesting that female attitudes are changing.

Further research has claimed that gender differences do clearly influence students' academic achievement in online environments.^{5,47,50} Price⁴⁷ found that male students performed better than females when they work collectively with others online. Similar results were also reported by Lai and

Kuo⁵ who indicated that language development skills of male students was higher than female students in developing the same skills using e-learning programs. Male students were additionally reported as having more positive learning attitudes and less learning anxiety towards using e-learning programs for their English language learning than female students.

Conversely, Yukselturk and Bulut⁵⁰ when analyzing gender differences in achievement in an online learning environment found no statistically significant mean differences among motivational beliefs, self-regulated learning variables and achievement with respect to gender.¹⁶ also did not detect any statistically significant differences between genders in language proficiency. Luis et al. conducted a meta-analysis of 14 empirical studies dealing with web-based learning and gender effects. Results suggested that gender effects are insignificant. Benbunan-Fich and Hiltz⁵¹ analyzed data for almost 2000 students to identify the learning outcomes for courses in three different modes of e-learning (completely online, mixed and completely on campus) with gender on final grades. It was found that female students achieved higher grades than male students regardless of the e-learning mode. A possible explanation for the inconsistency in findings for differing online gender interaction can be accounted to the differences in the environment, culture and educational history of a learner.

Interaction effects between e-learning modes and gender on Arabic language achievement

The achievement of students assigned to the both types of EL modes (EL + CL, EL – CL) was not found to be significantly affected by gender on the adjusted mean post-test scores. This finding invalidated the hypothesis as the EL approach was found to be equally beneficial in improving the achievement of male and female students.

The findings of this study support previous positions in the literature^{50,52–54} that have not identified significant interaction effects between gender and online learning on achievement. Lai and Kuo⁵ found that through various cooperative and interactive activities, e-learning helped language learners strengthen their linguistic skills, which positively affected learning attitude and helped individuals build self-confidence. These abilities gained through e-learning were also found to promote language learners' learning motivation. According to Merino et al.¹⁴ motivation is the main variable affecting online students' performance and therefore it appears as an important driver for indirect positive influence on students' performance when using e-learning system for both male and female students.

Several other studies^{45,47,55,56} however are in dissonance with the above findings as they show that male and female students experience an online environment differently with respect to several issues such as performance, motivation, perceptions, study habits and communication behaviors. The reason why the results of these studies did not agree with our findings could be related to the gender segregation of students, in addition to the different online environment and different tools used to measure the learning outcomes.

Study limitations

As with any study, there are a number of limitations that need to be considered. The study was conducted over a 10-week period, which only represented 75% of the actual semester. Although the study findings adequately demonstrated the importance of e-learning in increasing the achievement of students at the university level, longer term studies would be required to further validate these findings not only for achievement in language studies, but also in other subject areas. Future research may include the investigation of other moderating variables such as students' learning style, cognitive load level and student attitudes toward using e-learning environments in teaching and learning at the university level.

Similar studies conducted in universities across the Middle East would also help to illustrate whether the achievement of students in other segregated and non-segregated universities is comparable to the achievement levels recorded for gender segregated students in this study.

Recommendations

It is proposed that a combination of e-learning supported by cooperative learning is integrated into students learning at the university level as the results have demonstrated a higher level of achievement of students assigned to this learning method.

Course designers and instructors may benefit from the conceptual framework of designing cooperative online learning modules that emerge from principles of the activity theory and social

constructivism, such as those integrated into the BB system. An approach to designing online learning that is interactive will allow learners to engage their various senses, learn interactively at their own pace and from others whilst improving interpersonal and communication skills, through the use of communication tools such as online discussion boards. Understanding the different mediums for online discourse is vital for instructors to be able to design a more participatory learning environment which maximizes on the outputs of e-learning.

The differences observed in this study between the genders in achievement through cooperative e-learning should encourage course designers to consider gender characteristics and culture. The recommendations are that online instructors should consider learner perceived interaction to establish a user-friendly online community incorporating warm welcome messages to help minimize gender differences. Online interaction should be monitored by instructors to assess the frequency and quality of interaction between students online with the aim of encouraging the use of the Socratic conversational style to help illuminate ideas.

In order to maximize the learners' role in online interaction, it is advised that instructors ensure that rules for interaction/posting frequency and style of feedback are understood. It is also important that instructors do not overlook the teaching of basic course objectives and familiarity with instructor expectations so that students clearly understand the learning outcomes which facilitates their learning. A focus on instructors giving motivational encouragement and support to learners may also help harbor positive attitudes and allow for more interdependence and social interaction between group members.

CONCLUSIONS

The paper has attempted to highlight the benefit of e-learning with cooperative learning on student achievement, based on the principles of social constructivism and activity theory integrated into an online interactive platform. It was found that by implementing a cost-free cooperative e-learning approach for students' at the university level resulted in improved overall achievement.

The rapid technological advancements that have been seen in the last decade have not been matched by the effective implementation of this technology in teaching to maximize the achievement of learners. To benefit from the latest technologies, there is a need to integrate this with active learning strategies such as cooperative learning to improve student achievement through the use of communication tools available online such as discussion boards, live chat, online collaborative group activities and assessment.

Further research however is still required to investigate the impact of different e-learning modes on the cognitive preferences and styles of learners. The implementation of the cognitive load theory in designing new e-learning environments may provide some empirically-validated guidelines for developing effective e-learning language courses for university students.

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