

The Effects of Using On-Line Instruction on the Achievement of Sultan Qaboos University Students and their Attitudes Towards it

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Abstract

This paper describes a quasi-experimental research conducted on on-line instruction (OLI). It specifically uses WebCT (Web Course Tools) Courseware package to evaluate the effectiveness of OLI on Sultan Qaboos University students' achievement and their attitudes towards it in an educational technology course. The results show that there is no significant difference in the achievement of both groups (experimental and control). In addition, there is no significant difference due to gender variable. Further, the results show a significant difference due to grade point average (GPA) variable in favor of high achievers as compared to low achievers. Concerning the interaction effects, the results suggest an interaction effect between (GPA and Gender) and (Method and GPA) only. The results also show a positive attitude toward OLI. The researchers give some recommendations and suggestions to improve OLI environment at Sultan Qaboos University.

Introduction

On-Line Instruction (OLI) becomes a useful instrument in various university disciplines. Academic content is designed and offered on-line by the means of e-mail, faculty sites, and specific software such as WebCT (Web Course Tools). The latter, for example, is a courseware package originally developed to manage on-line course provision. It has been described as "one of a new generation of software that provides easier solutions to problems encountered in using the Internet" (Agar-

wal & Day, 1998a). Sultan Qaboos University (SQU), in its endeavor to improve teaching/learning methods, provides faculty members with the opportunity to use this package. This method is combined with face-to-face teaching. Therefore, conventional class sessions remain an essential part of teaching. This experimental study evaluates the effectiveness of OLI on students' achievement and their attitudes towards it in an educational technology course. The course is compulsory for all students in the College of Education. In this study, only two groups were selected.

Literature Review

The instructional effects of media have provided a platform for diverse opinions. On one hand, Clark (1983, 1994) maintained that media do not influence learning in any condition. In contrast, Kozma (1994) argued that technologies such as computers and video influence learning by interacting with an individual's cognitive and social processes in constructing knowledge. More recent literature has supported Kozma's above argument. Felder (2001) mentioned that the meta-analyses of hundreds of studies show that students who learn through interactive web-based technologies tend to do better than students taught the same courses with chalk-and-talk. Thus, many researchers suggest assessing learners' psychological factors before formal distance instruction in order to individualize instruction (Ross, 1998).

On-line education differs from traditional education, as it includes a variety of formats: asynchronous web-based instruction, bulletin board discussion, e-mail communication, as well as synchronous online chat and net conferencing (Kearsley, 2000). Indeed, the recent rapid development of educational technology has positively influenced many aspects of education at all levels directly or indirectly (Troxel & Grady, 1989; Muffoletto, 1990; CEO Forum, 2000). Recent research involving online education has emphasized the learners' achievement and course evaluation (Kearsley, 2000; Russell, 1999). Moreover, research shows that OLI promotes self-learning and develops an understanding of learning styles (Hoven, 1999). It combines studying materials with exciting context. OLI fosters the concept of "open curriculum" (Candlin & Byrnes, 1994) in which students are encouraged to look beyond the

structure and the content of the course and explore multiple channels of information. However, Carr (2000) suggests it is crucial to strike a balance between content and student interaction.

Although there is some literary evidence that students are very concerned about the loss of direct contact with the instructor and their emphasis on the importance of personal relationships in OLI environment (White, 2000), students are generally in favor of the on-line delivery of courses. It was reported that students who had access to a set of web-based instructional materials performed better than students who did not have access to these materials. Moreover, on-line instruction proved to have a positive impact on student retention and learning of academic concepts, attitudes towards subjects, and perception of instructor effectiveness (Agarwal & Day, 1998a; Navarro & Shoemaker 2000). Many studies found that student satisfaction with on-line instructional techniques increased, there was greater interaction between students and between students and instructors, and critical thinking and problem-solving skills were normally reported to improve. Moreover, grade point average and other measures of student achievement are as high as or higher under on-line teaching than in conventional teaching (Mason & Kaye, 1989; Bruce *et al.*, 1993; Hiltz, 1994; Gregor & Cuskelly, 1994; Berge & Collins 1995; Makrakis *et al.*, 1998). However, Felder (2001) comments that "evidence from thousands of studies showing that a significant increase in learning, skill development, and confidence results from properly implemented active and cooperative methods".

Although there is literary evidence that younger students tend to be less enthusiastic of using on-line instruction, other research results show student utilization of the on-line material was significant, especially when the fact that these students were primarily freshmen and sophomores and campus residents is taken into account (Coates & Humphreys, 2001). Kearsley *et al.* (1995) who studied the effectiveness of on-line educational technology courses came to the same conclusions. they conducted a survey on 14 students who had completed on-line educational technology courses. Students felt they were more knowledgeable than before they started the courses. However, there is no evidence that this is merely caused by on-line design of instruction.

Zywno & Kennedy (1999) conclude that student attitudes towards integrating the internet and multimedia into instruction are positive and that "students greeted the technology-enabled course with enthusiasm".

Agarwal & Day (1998b) report that students clearly found WebCT very user-friendly. More than three quarters of the students preferred the WebCT enhanced courses to conventinal course offerings, and their attitude towards taking a course that used WebCT again was strongly positive. They add that the students rated all aspects: communications, content delivery, and on-line testing of WebCT as very good, and seemed to give content delivery the highest rating. Comments on the survey indicated that students enjoyed the increased access to the instructor, and benefited from the class notes available on the Web pages. Several students remarked about the availability of their grades in a prompt and convenient manner. The researchers concluded, "The use of these new programs does not have to be exclusive to on-line courses and distance learning. In fact, the majority of our applications of the technology are in supplementing and enhancing conventional course offerings".

In a recent study, Agarwal & Day (2000) found that it is possible to partially substitute classroom (physical) capital and in-class instructor time with the on-line instruction without diminishing the information content that students receive. They further found a positive impact on both student performance and their perception of instructor effectiveness using technology, and that women tend to benefit the most in the experimental environment. They attributed the above results to active learning activities, Internet monitored preparation prior to in-class meetings, graded and interactive on-line quizzes and tutorials, smaller classes, and greater interaction among students and the instructor. In addition, they suggest that a large part of the benefits stem from increasing active participation and decreasing the passive learning components of the course. They also found that one of the main value added aspects of on-line instruction use was the ability to track student participation, and structuring of students' out of class studying.

In the Gulf area, Al Mazeedi and Ismail (1998) conducted a study on the educational and social effects of the internet on Kuwait University students and found that the educational environment, discipline of study, and resources available to the students play a key role. As an experimental stage at SQU, there are little reports on the effectiveness of WebCT in

specific and OLI in general. Research results show that Internet instructional uses at SQU are mostly limited to obtain information. This suggests that these uses should be encouraged and broadened beyond their present status (Abdelraheem & Al Musawi, 2002).

Objectives and Questions

This experimental research aims at studying the effects of on-line instruction and the attitudes of Omani students at the Sultan Qaboos University towards it. This is implied in answering the following questions:

- 1 - Are there any differences in students' achievement due to teaching method (conventional or on-line)?
- 2 - Are there any differences in students' gains, that can be attributed to gender or GPA?
- 3 - Are there any interaction effects of gender with method, GPA with method, and gender with method with GPA?
- 4 - Do students' attitudes differ before and after applying on-line teaching method?

Rationale

- Exploring the benefits/disadvantages of OLI in the field.
- Promoting OLI at SQU by introducing field evidence.
- Motivating efforts of instituting well-designed on-line programs.
- Relating to other studies at SQU and elsewhere since many conclusions are felt to be preliminary.

Procedures

- A one month "educational technology" course was designed and delivered to:
 - 1 - Experimental group: Students on WebCT at multimedia labs with minimal involvement on the part of the instructor.
 - 2 - Control group: Students with conventional classroom meetings with no access to WebCT.
- One instructor using the same text and tests taught both groups.
- The OLI method was kept up to the original teaching arrangement and objectives to reduce inherent limitations of the courseware.
- The WebCT platform was composed of the following features: e-mail, on-line teams/instructor discussions, and feedback. These activities are performed in four on-line lab sessions (one session per

week), on-campus attendance (asynchronous), and/or during office hours (asynchronous). The skills of using these tools were taught to the students before conducting the study.

- Both groups are taking the course material for the first time and they have no prior knowledge in the subject matter. Pretest shows no significant difference in their mean scores; i.e. the two groups are equivalent (experimental group mean was 15.65 and standard deviation of 1.79; control group mean was 15.30 and standard deviation of 1.67; t value was 0.886 and $P > 0.05$).
- A final test was given to measure the experimental group achievement as compared to the control group. The Kuder-Richardson-20 internal consistency reliability estimate of the test was 0.92 (contact the authors for the test items).
- An attitude instrument (20 items Likert type scale) was adapted and given, before and after, to the students in order to measure the experimental group attitude towards using OLI. Cronbach alpha internal consistency reliability estimate of the attitude survey was 0.74.

Subjects

The research sample consists of 51 students in their sixth semester at SQU; due to timetabling constraints, a cluster sample is used. It comprises an experimental group of 31 students and a control group of 20 students. The two groups are randomly assigned to experimental group and control group. Table (1) shows their statistics.

Design and Statistical Treatments

A quasi-experimental design was used in this study with the following variables:

Dependent variables:

- 1 - Students' achievements measured by their grades in the final test.
- 2 - Students' attitudes measured by their response to the attitudinal scale.

Independent variables:

- 1 - Teaching methods [WebCT (OLI) or conventional].
- 2 - Students' gender: (male and female).
- 3 - Students grade point average: (high, average, and low).

While three way analysis of variance (2x2x3ANOVA) is used to answer questions 1, 2, 3, and 4, t-test is used to answer question 4.

Results and Discussion

Basic descriptive analysis in Table (1) shows mean scores and standard deviations for the subjects of the study. It also shows that both discipline groups comprise 51 students: 31 (61%) students of the experimental and 20 (39%) of the control. They are approximately of equal distribution on the three GPA levels as 17 students with low GPA, 21 students with average GPA, and 13 students with high GPA. Data also shows an approximately equal distribution of males (27 students; 53%) and females (24 students; 47%) in both groups.

Table (1)
Mean scores and standard deviations

Independent Variables	Value Label	N	Mean	Standard Deviation
Teaching methods	WebCT	31	79.7097	6.50
	traditional	20	79.1250	7.73
GPA	low	17	77.11	7.02
	average	21	79.05	5.70
	high	13	83.19	7.59
gender	male	27	77.5741	7.14
	female	24	81.625	6.16

* Teaching methods, gender, GPA and interactions effects on achievement

To answer questions 1, 2, and 3, concerning differences in students' achievement due to teaching methods, gender, GPA; and interaction effects, three way analysis of variance was used.

Table (2) shows that among the three main effects only GPA has statistical significance at 0.05. The findings of (Mason and Kaye, 1989; Hiltz, 1994; Gregor and Cuskelly, 1994; Bruce *et al.*, 1993; Makrakis *et al.*, 1998) support this finding. Multiple comparisons Scheffé test was used to determine which group of GPA is better than the others. The findings are listed in Table (3). It demonstrates statistical significance in favor of students with high GPA in comparison to their low GPA colleagues. This

finding shows that students with high previous GPA achieve better than those with low previous one regardless of teaching method or content.

Table (2)
Teaching methods, gender, and GPA effects on achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
METHOD	6.910	1	6.910	.213	.647
GPA	261.139	2	130.569	4.032	.026*
SEX	46.724	1	46.724	1.443	.237
METHOD* GPA	279.038	2	139.519	4.309	.020*
METHOD* SEX	64.615	1	64.615	1.996	.166
GPA * Sex	288.522	2	144.261	4.455	.018*
METHOD* GPA * SEX	77.187	2	38.594	1.192	.314

* means statistical significance at $\alpha = 0.05$

Table (3)
Multiple Comparisons Scheffé test for GPA

(I) achievement	(J) achievement	Mean difference (I-J)	Std. Error	Sig.
low	average	-1.9776	1.8565	.572
	high	-6.0747	2.0965	.022
average	low	1.9776	1.8565	.572
	high	-4.0971	2.0082	.138
high	low	6.0747	2.0965	.022
	average	4.0971	2.0082	.138

Based on observed means (The mean difference is significant at the .05 level).

However, Table (2) findings also mean neither teaching methods (conventional or OLI) nor gender has a significant influence on students' achievement. As for the teaching methods, this finding does not necessarily sound very promising compared, in specific, to Felder (2001) and Agarwal and Day (1998a, 1998b, 2000) studies. However, it is in line with other research showing that the students' achievement in OLI is similar to face-to-face method (Johnson, 2002, Carey, 2001; Gagne & Shepherd, 2001; Johnson *et al.*, 2000; Kearsley *et al.*, 1995). Moreover, Clark (1983, 1994) negates the influence of technology on learning. In view of this major finding, OLI should be approached with caution at SQU, since students might need more preparation to use technology. That technology itself should be prepared as well in order to have greater effect on students' achievement.

In addition, the results indicate that there is no significant difference in the students' achievement due to gender. That means males and females students achieve the same results. This contradicts Agarwal and Day (2000) in that women tend to benefit the most in the experimental environment. This result could be attributed to the fact that males and females students at SQU have equal educational opportunities and accessibility to learning resources. They all live on the same campus enjoying the same facilities: housing, transportation, and financial aid.

As shown above, there is an interaction effect between method and GPA and an interaction effect between gender and GPA. However, Fig (1) graphically represents the mean scores for the three levels of GPA.

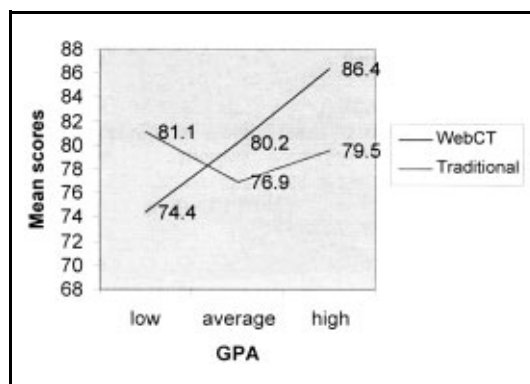


Fig (1): Graphic representation of the mean achievement scores for WebCT and traditional methods on three levels of GPA.

From Figure (1), it is observed that students with high GPA and average GPA are relatively scoring better in the WebCT method than their counter partners in the traditional method. While students with low GPA in the traditional method are relatively scoring better than their counter partners in the WebCT method.

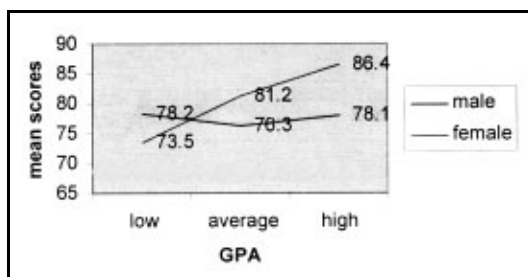


Fig (1): Graphic representation of the mean achievement scores for males and females students on the three levels of GPA.

From Figure (2), it is observed that female students with high GPA and average GPA are relatively scoring better than male students with the same GPA. While male students with low GPA are relatively scoring better than female students with the same GPA. This result could be attributed to the fact that female students with high and average GPA tend to preserve their performance while females with low GPA are not doing so due to their low career expectations.

*** Students' attitude towards OLI**

To answer the fourth question on students' attitudes before and after applying on-line instruction method, t- test was used. Table (4) shows the findings.

Table (4)
T-Test for the difference in means in the attitudes

Item	N	t	df	Mean	Std Deviation	Sig. (2-tailed)	Mean Difference
pre-attitude	31	39.945	30	32.387	4.514	.000	32.3871
post-attitude	31	56.340	30	48.225	4.765	.000	48.2258

Pre- and post- experimental attitudes show statistical differences at 0.05. This means that students' attitudes are in general positive towards OLI. These attitudes were practically noticed by the instructor in the classroom and through off-classroom OLI applications by means of e-mail discussion. This could be justified by the fact that students found WebCT as an exciting and enjoyable tool for learning especially when they are off-campus since it provides them with freedom, flexibility, and privacy to express their own thoughts and feelings. This finding is clearly mirrored in the literature (Kearsley *et al.*, 1995; Agarwal and Day, 1998b; Zywno and Kennedy, 1999; White, 2000; Navarro and Shoemaker 2000; Agarwal and Day, 2000; Coates and Humphreys, 2001).

Conclusions and Recommendations

The following conclusions can be detected:

- 1 - OLI is equally effective in students' achievement as traditional teaching methods.
- 2 - Students' achievement is affected by one main variable: GPA.
- 3 - Achievement is in favor of students with high GPA in comparison to their low GPA colleagues.
- 4 - Results show two interaction effects: method*GPA and GPA*gender.
- 5 - Students' attitudes are in general positive towards OLI.

Following are the research recommendations:

- 1 - OLI should be approached with caution at SQU.
- 2 - Issues of technology availability and effective use should be addressed and ensured before full implementation of OLI takes place.
- 3 - Faculty members at SQU should give more attention to their low GPA students in due process of implementing OLI.
- 4 - Faculty members at SQU should be trained to develop their hi-tech skills specifically in Internet-based and on-line technologies.

Further, the following studies are recommended:

- 1 - Analyzing SQU needs/standards of on-line instruction with/without face-to-face teaching methods.
- 2 - Effects of using cooperative learning on individual and teams' achievement in an on-line instruction course at SQU.
- 3 - Privacy and credibility of OLI and e-learning.

تأثير استخدام التعليم الشبكي المباشر على الإنجاز الأكاديمي لطلاب جامعة السلطان قابوس واتجاهاتهم نحوه

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الملخص

تصف هذه الورقة بحثاً شبه تجريبي تم إجراؤه على التعليم الشبكي المباشر، حيث استخدمت رزمة WebCT (أدوات المقرر الشبكي) الوسائطية لتقويم فاعلية هذا النوع من التعليم في الإنجاز الأكاديمي لطلاب جامعة السلطان قابوس واتجاهاتهم نحوه أثناء دراساتهم لمقرر تقنيات التعليم. وأظهرت النتائج عدم وجود فرق دال إحصائياً في الإنجاز الأكاديمي بين كلتا المجموعتين (التجريبية والضابطة)، وعدم وجود فروق ذات دلالة إحصائية بالنسبة لمتغير الجنس. في حين أن النتائج أظهرت فروقاً دالة إحصائياً بالنسبة لمتغير معدل نقاط التقدير (GPA) لصالح الطلاب ذوي الإنجاز المتفوق مقارنة بدوي الإنجاز المتدني. وأظهرت النتائج أن هناك تأثيراً تفاعلياً واحداً فقط هو بين متغيرات (معدل نقاط التقدير والجنس) والطريقة ومعدل نقاط التقدير. وقد تبين أن هناك اتجاهات إيجابية من قبل الطلاب نحو التعليم الشبكي المباشر. وعليه، قدم الباحثان بعض التوصيات والاقتراحات لتحسين بيئة هذا النوع من التعليم في جامعة السلطان قابوس.

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