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## Editorial

# The Changing Environment for Education

Donald G. Perrin

For the first half of the 20<sup>th</sup> century, educational media were expensive; especially 16mm motion films and projectors. Prints were expensive - almost one hundred dollars for ten minutes of color film - and equipment was shared between many classrooms. Audiovisual media were designed group use - one-way communication one-to-many. Based on research conducted during World War II, audiovisual media were most effective when a teacher (or trainer) set the stage, introduced the presentation, and followed up with questions, discussion and summary.

The second half of the century saw a change from mechanical devices and photographic media to electronic and digital media. Over time, equipment was miniaturized, powerful, and low in cost. Lesson materials were designed for small groups and individuals. Technologies became interactive and, based on student feedback, could adapt to the individual learn needs. Language labs, teaching machines, and computers could customize learning and provide text, audio and/or visual feedback

Advent of the personal computer in the late '70s, public Internet in the '80s, and graphic user interface and world-wide web in the early '90s provided interactive learning with a full range of presentation and feedback options – text, graphics, pictures, animations, motion images, sound, and the ability to simulate a wide range of mechanical and electronic devices. Ease of use, miniaturization, reduced cost, increase in power and memory, and superior graphics and video have stimulated adoption for home and business.

In the 21<sup>st</sup> century, networked computers with digital displays integrate the functions of all group and individual media. Local networks and the Internet have opened a treasure trove of learning resources. Simulation and motion sensitive devices have become commonplace for gaming and for instruction. Mobile devices now integrate telephone and video-phone with the power and memory of a PC and access to global networks. They have made learning mobile so that students and professors can connect from almost anywhere to anywhere and at any time. The success of these devices have transformed them into social media like facebook that are used widely by all age levels.

Each new innovation extends opportunities for research, study, communication, interaction, sharing and problem-solving and support *learning*. Learning Management Systems integrate dissemination and feedback and automate routine administrative tasks for education providers. To use these technologies effectively, traditional institutions of higher education need to reassess educational policies and procedures that constrain learning. For example, in dealing with adult learners:

1. Does a student need to be present at a particular place and time for advisement, registration, instruction, evaluation, and graduation? Or can it be accomplished on the web 24 X 7?
2. Can we provide flexibility for students to customize degree and certificate curriculum and programs according to their individual needs?
3. Is it necessary for a class to be scheduled with specific start and end dates based on a semester or quarter system? Or can classes be offered demand and with more flexible time frames?
4. Can we provide flexibility for students to manage their learning schedules to fit with family and professional schedules, business and personal travel, and crises in health, family, and job?

5. Is it important to have all student fit predetermined deadlines? Is it appropriate to *punish* a student for failing to meet a deadline? To what extent can time and date be flexible to meet individual student needs?

The increasing complexity of everyday life makes it necessary to education to adapt to the changing environment. Education as we know it constrains participation and impedes graduation for many because of their geographic location and demands of family, job, and health. To attend on-campus classes and learn face-to-face from the instructor is less and less possible.

Institutions that complement on-campus with distance learning programs have increasing enrollments. In the process they discover a new challenge – to compete in the national and international arena with high quality educational programs that are on-campus, distant, and hybrid. Tony Bates has indicated that the cost of constructing and maintaining a brick-and-mortar campus is pushing fund-raising, endowments, and student tuition to unsustainable levels. The current economic climate makes the need for change more urgent.

**Editor's Note:** In a global society we must be aware of national trends and develop higher standards for teaching and learning. This study embraces instructional design, trends in distance education, and increase in national and global standards. It adds data to support quality improvement in academic distance learning.

## **Evaluating and Improving an Online Program for Graduate Students Enrolled in a Research Methods Course in Physical Education and Health**

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### **Abstract**

This research studied the learning experience satisfaction levels of forty-three students enrolled in an online Research Methods course by establishing the acknowledged importance of five major variables to them, their learning experience satisfaction in each area, and the lessons learned through the various differentials. An online survey was used to determine these ratings and the resulting descriptive statistics, including mean scores and standard deviations, were calculated to lead us to appropriate conclusions. Furthermore, statistically significant differentials in each variable between acknowledged importance and learning experience satisfaction ratings were analyzed using a paired-samples *t*-test, at the .05 level of significance. The study conclusively demonstrated that students were, in general, satisfied with this on-line approach, but the differentials in evaluations indicated areas for program improvement.

**Keywords:** distance education; students' perspective; asynchronous learning; traditional courses; perceived satisfaction; higher education; virtual classroom; online course design; online learning; perceived importance

### **Introduction**

The United States Census Bureau has carefully examined the use of computers and the Internet in American households. According to that report, the percentage of households having personal computers has dramatically increased from 8% in 1984 to 62% by October of 2003 (U.S. Census Bureau, 2005). The percentage of American households with Internet access has also expanded tremendously. According to the same United States Census Bureau, the percentage of households with Internet access has grown from 18% in 1997 to 50% in 2001 and finally to 55% in 2003 (U.S. Census Bureau, 2005). Because of this increasing access to personal computers and the internet, online distance learning enrollment at universities and colleges across the country has grown tremendously. The Sloan Consortium surveyed more than 2,500 colleges and universities nationwide and in their final report stated:

Over 3.9 million students were taking at least one online course during the fall 2007 term; a 12 percent increase over the number reported the previous year. The 12.9 percent growth rate for online enrollments far exceeds the 1.2 percent growth of the overall higher education student population. Over twenty percent of all U.S. higher education students were taking at least one online course in the fall of 2007. (Allen & Seaman, 2008, p. 1)

As this trend toward online education in higher education continues, many universities and colleges nationwide now offer online courses in a variety of areas (Pulichino, 2006). In recent years, for example, an online master degree program for Physical Education began appearing in a number of colleges and universities across the United States. Ball State University, Boston University, Canisius College, Emporia State University, Florida State University, Georgia Southern University, Ohio University, the University of Houston, and the University of South Florida - all offer evolving long distance learning programs of this nature.

With this “exponential growth” of “online learning” in higher education, thoughtful and important questions continue to appear about the quality level of such “long distance” methodologies (Muirhead, 2000; Spellings, 2006). It is important to examine the quality of online courses from the student’s perspective. The “perceived satisfaction” level of students - how they sincerely felt about their learning experience - is an integral component of any approach to the measurement of the success of an online learning curriculum (Lin & Overbaugh, 2007; Roach & Lemasters, 2006). Students must be respected as individuals who have definite expectations about what they want and need from an online learning experience. It is important to understand that a student’s “perceived satisfaction” about an online learning experience exists when the expectations any student brings to the distance learning course are matched or exceeded. When an online learning program fails to understand and meet these expectations, the “perceived dissatisfaction” of students will eventually become clear in “overt” ways.

Within this context of expanding long distance learning programs, measuring both the levels of acknowledged curriculum importance and learning experience satisfaction has become necessary in order to effectively examine the student’s mastery of any online approach to a core content. In addition, any approach to an online course assessment that evaluates both the level of content importance and the level of the students’ “perceived satisfaction” provides us with a means to improve those areas of core content that are rated highly in importance, but also show lower indicators of student satisfaction. Instructors can work at reducing the gaps that exist between content importance and students’ satisfaction levels with information of this nature; this can be accomplished by magnifying course strengths and revising evident course weakness.

Many researchers have also examined the effectiveness of technology-based instruction (Bennett & Green, 2001; Brown, 2003; Fallah & Ubell, 2000; Johnson et al., 2000; Larson, 2009; Russell, 1999; Schulman & Sims, 1999). These studies compared test scores and the general performance levels of students enrolled in technology-based courses to those of students enrolled in traditional face-to-face courses. In general, these studies demonstrated that there was not a significant difference in student achievement between these two instructional methods. As a result, it has been shown that students learn as well through technology-based instruction as they do in traditional “face-to-face” instructional frameworks. The “virtual classroom” is working well.

In addition, there have been significant research studies that have focused on a variety of factors that influence the students’ “sense of satisfaction” in online distance learning situations. The factors include “frequent interaction between student and instructor” (Dahl, 2004; Pontz, 2006; Richardson & Swan, 2003); “active interaction between student and student” (Cannon et al., 2001; Swan et al., 2000; Wanstreet, 2006); “timely feedback from the instructor” (Benbunan-Fich, Hiltz, & Harasim, 2005; Howland & Moore, 2002; Pontz, 2006); and “readily available technical support” (Jonassen et al., 1999; Moody, 2004; Qureshi, 2004). All are identified as having critical importance in establishing the likelihood of high student satisfaction levels with online course learning situations.

These studies reported that there was an important relationship between the nature of “interaction” in an online course and student satisfaction levels. The studies showed quite clearly that students who had a higher level of “perceived interaction” between the instructor and themselves, as well as that among the students enrolled with them in the course, usually reported a high level of personal satisfaction as well as satisfaction with the various educational outcomes. These studies also suggested that immediate feedback from the instructor to the students’ questions, assignment concerns, and ongoing discussion topics contributed significantly to the students’ perceived satisfaction with the online learning experience.

In addition, the studies that related to the variable of technical support as a factor in satisfaction levels showed that a significant correlation existed between the students’ satisfaction and “readily

available” technical support for the online course itself. These studies documented the fact that some students working “on-line” lack the necessary technical skills to do so easily, and therefore experience some frustration. Consequently, students expect “readily available” technical assistance that is efficient, clear, and regularly updated.

There is a lack of literature on students' own perception of course importance and their various satisfaction levels for an online course. This study explored the perceptions of curriculum importance and learning satisfaction that graduate students enrolled in an online Research Methods course assign to five key variables. Furthermore, the differences the study revealed between the “perceived importance” of the course and the resulting “student satisfaction levels” were quantified and analyzed. The data evolved from courses taught in three different semesters, and have since updated our technological platforms with these results in mind.

## **Methodology**

### ***Participants***

Of the sixty-one graduate students enrolled this online Research Methods course in the summer and fall semesters of 2008, and in the spring semester of 2009, forty-three students voluntarily participated in this study. The study design and procedures were reviewed by the Institutional Review Board to ensure that all appropriate professional protocols were observed.

### ***Instrumentation***

The “Online Student Perceptions Survey,” developed by Sheila Hendry (2005), was used to determine the student’s ratings for both the importance of the course material and their “perceived satisfaction” with key variables associated with online courses. This instrument was selected because of its simplicity and relevance to online course work.

The original online student perceptions survey consisted of three parts. The first part contains seven demographic questions including those relating to age, gender, the number of online course hours one has completed, the number of online hours one currently is taking, the number of traditional courses one is taking including those that might have some kind of online component, the number of weekly work hours a student has in addition to course work, and the distance the student generally travels to and from campus. This data was used so that we might reach a better understanding of the background and personal characteristics of students enrolled in the online Research Methods course.

The second part of this survey included thirty six statements based on the five main variables usually associated with online courses. These five variables, with their respective Cronbach’s alpha, are “convenience” (importance .86; satisfaction .89); “emotional health” (importance .60; satisfaction .86); “communication” (importance .72; satisfaction .91); “student support” (importance .80; satisfaction .89) and “grade earned/knowledge learned” (importance .80; satisfaction .88). Survey results reflected an acceptable level of internal consistency (Hendry, 2005). Students were asked to rate the degree of importance of each of thirty-six statements using a 5-point Likert scale (1 = not important at all, 2 = slightly important, 3 = neutral, 4 = somewhat important, 5 = very important, and 0 = does not apply) and their level of satisfaction with these same statements using a 5-point Likert scale (1 = not satisfied at all, 2 = slightly satisfied, 3 = neutral, 4 = somewhat satisfied, 5 = very satisfied, and 0 = does not apply).

Section three of the survey included twenty statements which evaluate the online learning profile of students enrolled in the online Research Methods course. A 5-point Likert scale (1 = highly disagree, 2 = disagree, 3 = neutral, 4 = agree, to 5 = strongly agree) was used.

## **Procedures**

In order to collect data for the student's perceptions of the importance of the course core content and their learning experience satisfaction levels with our online program design and implementation, the online student perception survey developed by Hendry (2005) was packaged as a web-based survey by simply utilizing the components of CHECKBOX Survey Software v4.5 (Web Survey Software).

Next, the survey and informed consent form was posted on the online course site operating in the ANGEL Learning Management System for the summer and fall semesters of 2008, and the spring semester of 2009. The CHECKBOX Survey Software (v4.5) clearly presented the frequencies of responses for each item in the survey, which were then easily applied to further descriptive and inferential statistical analyses. At the beginning of the process, an email letter describing the study was sent to all students who had been enrolled during these three semesters. Those who were interested in the study then responded to all three parts.

## **Data Analysis**

Descriptive statistics, such as mean scores and standard deviations, were calculated to establish the students' perceptions of the importance of each of these major variables and their "learning satisfaction levels" when the course work was completed. The mean difference with regard to these two indicators was then calculated by subtracting the "importance grand mean" from the "satisfaction grand mean". Then, the statistically significant differences in each of the five areas between the importance scale ratings and the satisfaction scale ratings were analyzed using a paired-samples *t*-test, at the .05 level of significance. The statistical computation was completed using the Statistical Package for the Social Sciences (SPSS) 15.0 for Windows.

## **Findings**

### **Demographic data**

The demographic data demonstrated that the participants' group was somewhat typical for graduate programs, and that students were quite comfortable with the process and procedures of online, distance learning. Of the forty-three students who participated in this study, 56% were male and 44% were female. Only 2% of these students were younger than twenty-three years of age, 67% were 23-28 years of age, 21% were 29-35 years of age, and 10% were 36-45 years of age. Most of the students had indeed taken online courses. A significant minority, 23%, had completed two online courses, but 77% had completed three or more courses. In addition, nearly half of students had completed traditional courses that did include a significant online component - 19% had taken one combined course, 14% had taken two combined courses, and 16% had taken more than three courses.

The data demonstrated as well that our sample students were employed for financial gain to great degrees while they carried relatively demanding academic loads of graduate work. One might even infer that distance learning has become the major pathway to their degree. With respect to "online hours" in their current course work, 23% were currently taking three credit hours in this manner, 47% were taking six credit hours, 23% were taking nine credit hours, and 7% were taking twelve credit hours. In response to the question that asked about their current hours of "for gain" employment, 40% worked forty-one or more hours per week, 30% worked 31-40 hours per week, 9% worked 21-30 hours per week, and 7% worked 11-20 hours per week. Only 12% of the sample worked 1-10 hours per week and 2% were full-time graduate students. Lastly, the demographic data revealed that 23% lived in the city area, 23% lived within twenty miles of the campus, 9% lived 21-75 miles from the campus, 14% lived over 75 miles from the campus, and 30% actually lived out of state.

### Profile Data

Our survey supported the thesis that students have a sincere respect for online learning as an instructional tool, that they are very comfortable with it, and that they do not believe that the core content is weakened in any way, or the material “dumbed down” through distance learning applications. The online learning profile of the students who were included in this study is demonstrated in Table 1.

Almost three-quarters (74%) of these students disagreed somewhat or disagreed strongly with the statement that they would not have taken an online course if there had been some other means of receiving credit available to them. A great majority of these students (86%) agreed with the statement, “I am comfortable working with computers,” while only 9% disagreed with it, and 5% voiced no opinion. More than half of this group (58%) agreed strongly and another 33% agreed somewhat strongly with the idea that they were “highly motivated,” and only 5% characterized themselves as “academically lethargic” in some way. In addition, more than three-quarters (77%) disagreed with the idea that they learned less than they expected when taking an online course. A clear majority of students (86%) disagreed with the idea that they felt isolated and alone while taking this course; only 9% agreed with it. Meanwhile, in response to the statement, “Getting a good grade is easy in an online course,” 70% of the students, a strong majority disagreed that notion; 16% agreed but 14% were uncertain.

**Table 1**  
**Online learning profile of the study sample**

Statement	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1. I am comfortable working with computers.	2.33	6.98	4.65	18.60	67.44
2. Working online provides me with learning opportunities that I otherwise would not have.	4.65	11.63	16.28	39.53	27.91
3. By taking this course, I will meet degree requirements.	.00	.00	2.33	11.63	86.05
4. I consider myself to be highly motivated.	2.33	2.33	4.65	32.56	58.14
5. I am comfortable with the anonymity of the online structure.	6.98	11.63	6.98	39.53	34.88
6. Getting a good grade is easy in an online course.	25.58	44.19	13.95	9.30	6.98
7. My performance in this online course is reflected in my grade.	2.33	4.65	20.93	46.51	25.58
8. I would not have taken an online course if there had been some other means of receiving credit.	39.53	34.88	11.63	6.98	6.98
9. My grade suffers in online courses.	20.93	20.93	23.26	18.60	16.28
10. Getting a good grade is difficult in an online course.	11.63	16.28	16.28	34.88	20.93
11. I learned less than I expected from online courses.	46.51	30.23	11.63	6.98	4.65
12. I prefer to work with others rather than on my own.	32.56	27.91	23.26	13.95	2.33

Statement	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
13. I feel isolated when working online.	55.81	30.23	4.65	4.65	4.65
14. Student cooperation is valuable to me.	18.60	16.28	27.91	20.93	16.28
15. I work best when I have a partner.	30.23	27.91	25.58	13.95	2.33
16. Learning through online courses is boring.	27.91	44.19	16.28	11.63	0.00
17. I feel comfortable working within instructor-regulated time frames, as in traditional classes.	30.23	27.91	16.28	16.28	9.30
18. I feel anxious about submitting work online.	30.23	32.56	13.95	20.93	2.33
19. I do not like having to wait for the instructor to respond to my e-mail.	6.98	16.28	18.60	30.23	27.91
20. I would prefer to take tests on paper rather than on a computer.	30.23	27.91	20.93	11.63	9.30

Note,  $N=43$ ; Scores were presented as percentage (%) of number of frequency for each statements.

### Variables Data

The differences between the students' perception of the importance of the course work and their level of satisfaction with each of the variables associated with online course experiences were analyzed using a paired-samples  $t$ -test, at the .05 level of significance.

**Table 2**  
**Results of paired-samples t-test evaluating differences between perceived importance and satisfaction with selected variables**

Category	Importance		Satisfaction		Difference <sup>a</sup>		$t$	$P$
	$M$	$SD$	$M$	$SD$	$M$	$SD$		
Grade earned/Knowledge learned	4.83	.46	4.26	.90	-.56	.02	7.62	.00*
Student Support	4.68	.58	4.27	.90	-.41	.90	6.78	.00*
Emotional Health	4.55	.74	4.31	.91	-.24	1.09	2.62	.01*
Communication	4.58	.77	4.42	.78	-.15	.94	2.41	.02*
Convenience	4.59	.72	4.56	.64	-.03	.76	.54	.59

Note.  $N = 43$ ; <sup>a</sup>Difference scores were calculated by subtracting from satisfaction scores to importance scores for each variable.; \* $p < .05$ .

As demonstrated in Table 2, the results showed that there were statistically significant differences between the acknowledged importance of the core content and their learning satisfaction levels with regard to values: "emotional health,"  $t(42) = 2.619$ ,  $p < .05$ , "communication,"  $t(42) = 2.412$ ,  $p < .05$ , "student support,"  $t(42) = 6.775$ ,  $p < .05$ , and "grade earned/knowledge learned,"  $t(42) = 7.622$ ,  $p < .05$ . The single exception to this pattern was with regard to the matter of "convenience,"  $t(42) = .540$ ,  $p > .05$ .

These descriptive statistics showed that the "grade earned/knowledge learned" was rated with highest variable on the importance rating ( $M = 4.83$ ,  $SD = .46$ ) but that it received the lowest rating on the learning satisfaction scale ( $M = 4.26$ ,  $SD = .90$ ). This large differential ( $M = -.56$ ,  $SD$

= .02) meant that the students expected, to some degree, grades higher than those received after they completed the course work. Meanwhile, the value of "convenience" was rated moderately highly on the importance scale ( $M = 4.59, SD = .72$ ) but received the highest rating on the satisfaction scale ( $M = 4.56, SD = .64$ ), yielding the smallest discrepancy observed. ( $M = -.03, SD = .76$ ). In that area, the course lived up to student expectations.

Remember that the student responses in the "4" integer indicated some real degree of satisfaction with core content and final learning experience. But, as Table 2 clearly demonstrates, all five major values carried a negative association between the "perceived" importance and the "perceived" satisfaction ratings. None of the variables had satisfaction mean values that met or exceeded the various mean values of importance. Further analysis was subsequently performed to determine what factors were involved in the causation of these differentials. Table 3 demonstrated the differences between students' perception of the importance of the course and their level of satisfaction in the always sensitive area of "knowledge learned/grade earned"- the matter of congruency between the work the students do and the formal assessment of it.

**Table 3**  
**Differences between perceived importance and satisfaction**  
**with each statement of grade earned / knowledge learned**

Statement	Importance		Satisfaction		Difference <sup>a</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
11. Passing the class	4.98	.15	4.16	.97	-.81	.98
23. Increasing my preparedness for class assignments	4.84	.43	4.26	.79	-.58	.79
13. Being prepared academically for future classes	4.60	.69	4.12	.91	-.49	1.01
12. Gaining knowledge of the content from taking this course	4.88	.32	4.51	.88	-.37	.87

Note.  $N = 43$ ; <sup>a</sup>Difference scores were calculated by subtracting the importance scores from the satisfaction scores for each statement.

A close scrutiny of the various questions asked in the variable "knowledge learned/grade earned" provided meaningful direction in improving that area of concern for students. The largest mean differential between importance and satisfaction ratings occurred with the statement that related to "passing the class" ( $M = -.81, SD = .98$ ), as one might expect. The statement was rated as the highest on the importance scale ( $M = 4.98, SD = .15$ ) but it was rated somewhat lower on the satisfaction scale ( $M = 4.16, SD = .97$ ), meaning perhaps that once students received the actual credit for the course, this matter shrank somewhat in vitality. In contrast, the statement "gaining knowledge of the content from taking this course" was rated as second in importance ( $M = 4.88, SD = .32$ ), but in terms of satisfaction was rated the highest ( $M = 4.51, SD = .88$ ), with the smallest discrepancy ( $M = -.37, SD = .87$ ). We concluded that, in general, the students felt that they had successfully mastered a core content that proved to be as important as they originally thought it might be. "Being prepared academically for future classes" was the statement rated as having the least importance to this group ( $M = 4.60, SD = .69$ ) and it also appeared as having the smallest value on the "satisfaction scale" ( $M = 4.12, SD = .91$ ).

The measurements in Table 4 address the issues related to the "technical" student support structures, an area to which we pay great attention. With regard to this clearly-stated variable, "readily available and appropriate technical assistance" was rated with a fairly high importance to them ( $M = 4.91, SD = .37$ ), but results indicated relatively low satisfaction levels. ( $M = 4.09, SD = 1.06$ ). Here we see the largest "gap" in the survey between importance and satisfaction levels ( $M = -.81, SD = 1.07$ ).

**Table 4**  
**Difference between perceived importance and satisfaction**  
**with each statement of student support**

Statement	Importance		Satisfaction		Difference <sup>a</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
36. Readily available and appropriate technical assistance	4.91	.37	4.09	1.06	-.81	1.07
33. Encountering few or no technical difficulties	4.95	.21	4.37	.82	-.58	.76
29. Access to readily available tutorials	4.23	.75	3.81	1.10	-.42	1.01
32. Instructor help in understanding the content matter	4.77	.43	4.37	.82	-.40	.82
34. Reliability of the server and/or equipment	4.93	.34	4.56	.63	-.37	.62
30. Having other online resources available to me for assistance	4.47	.67	4.14	.94	-.33	.89
31. Being able to rely on the textbook content	4.63	.62	4.42	.66	-.21	.67
35. Ease of learning new software	4.58	.63	4.40	.88	-.19	1.10

Note.  $N = 43$ ; <sup>a</sup>Difference scores were calculated by subtracting the importance scores from the satisfaction scores for each statement.

Meanwhile, “ease of learning new software” was rated as that value having the smallest discrepancy in scoring between importance and satisfaction ratings ( $M = -.19$ ,  $SD = 1.10$ ), meaning, we think that graduate students find mastery of new applications rather easy. “Encountering few or no technical difficulties” was the statement rated with the highest mean value on the importance rating scale ( $M = 4.95$ ,  $SD = .21$ ). We conclude that students simply want everything to work as advertised. “Reliability of the server and/or equipment” was that statement rated with the highest mean value on the satisfaction scale ( $M = 4.56$ ,  $SD = .63$ ) - a result that reflects on the normal daily operations of modern educational institutions. “Access to readily available tutorials” was rated with the lowest mean scores on both the importance and satisfaction scales ( $M = 4.23$ ,  $SD = .75$ ;  $M = 3.81$ ,  $SD = 1.10$ ). We conclude our students are comfortable about finding the technical expertise they might need.

**Table 5**  
**Differences between perceived importance and satisfaction**  
**with each statement of emotional health**

Statement	Importance		Satisfaction		Difference <sup>a</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
16. Being mentally prepared for taking tests online	4.91	.37	4.21	1.06	-.70	1.17
15. Having confidence in submitting my work online	4.74	.54	4.49	.77	-.26	.88
28. Being able to receive e-mail help from other students at our mutual convenience	4.28	.85	4.16	1.02	-.12	1.24
17. Being able to complete my work alone	4.60	.66	4.51	.67	-.09	.89
27. Being able to send blanket e-mails for help to other students at my convenience	4.21	.91	4.19	.96	-.02	1.14

Note.  $N = 43$ ; <sup>a</sup>Difference scores were calculated by subtracting the importance scores from the satisfaction scores for each statement.

The data in Table 5 reveals information about “comfort levels” of the students within the formal contexts of online learning. We conclude, in general, that students experience some frustration with “interactive” aspects of long-distance learning. “Being mentally prepared for taking tests online” had the highest discrepancy score between importance and satisfaction ratings ( $M = -.70$ ,  $SD = 1.17$ ). Perhaps students experience some frustration about how to prepare for the tests administered periodically in the program “modules.”

Meanwhile, the value “being able to send blanket e-mails for help to other students at my convenience” was perceived to be of lowest importance ( $M = 4.21$ ,  $SD = .91$ ) and was lowest as well on the satisfaction rating scale ( $M = 4.19$ ,  $SD = .96$ ), with in the smallest discrepancy ( $M = -.02$ ,  $SD = 1.14$ ). Students may be uncertain about how the “interactive methodology” in the program can best be utilized. “Being able to complete my work alone” was the idea rated with the highest satisfaction rating ( $M = 4.51$ ,  $SD = .67$ ) while “being able to receive e-mail help from other students at our mutual convenience” was rated with the lowest satisfaction rating ( $M = 4.16$ ,  $SD = 1.02$ ). Most find working alone through the program easier than the various group activities that are available and required.

The results in Table 6 reveal that a vital “by-product” often emerges in online learning. With regard to the “communication” variable, we learned that “improvement in my written communication skills” had the lowest importance to them ( $M = 4.21$ ,  $SD = 1.04$ ) but a relatively high satisfaction rating ( $M = 4.53$ ,  $SD = .67$ ). Here, we see the largest differential between importance and satisfaction ratings ( $M = .33$ ,  $SD = .99$ ). Obviously, we see the largest differential in the study which showed that students perceived themselves to have improved as writers because of this online learning course work - an unintended consequence but a very positive and important one.

**Table 6**  
**Differences between perceived importance and satisfaction**  
**with each statement of communication**

Statement	Importance		Satisfaction		Difference <sup>a</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
24. Improvement in my written communication skills	4.21	1.04	4.53	.67	.33	.99
20. Quality of student-instructor interactions	4.72	.73	4.42	.96	-.30	1.23
14. Receiving timely feedback about my progress from the instructor	4.91	0.37	4.63	.58	-.28	.70
18. Quantity of student-instructor interactions	4.53	.70	4.26	.82	-.28	.73
26. Getting personal feedback from the instructor	4.84	.43	4.60	.73	-.23	.81
25. Being able to contact the instructor at our mutual convenience	4.81	.45	4.58	.63	-.23	.78
21. Quality of student-student interactions	4.33	.87	4.16	.75	-.16	1.00
19. Quantity of student-student interactions	4.28	.98	4.21	.94	-.07	1.08

Note.  $N = 43$ ; <sup>a</sup>Difference scores were calculated by subtracting the importance scores from the satisfaction scores for each statement.

The idea stated as “quantity of student to student interactions” was rated quite low on the importance scale ( $M = 4.28$ ,  $SD = .98$ ) and it was lowest on the satisfaction rating ( $M = 4.16$ ,  $SD = .75$ ), resulting in the smallest discrepancy score ( $M = -.07$ ,  $SD = 1.08$ ). Students apparently feel online learning is not meant to help them improve the personal interaction skills. The statement

“receiving timely feedback about my progress from the instructor” was rated with the highest mean score on both scales ( $M = 4.91, SD = .37; M = 4.63, SD = .58$ ). We learned that students want a timely and appropriate response concerning the quality of their work.

As demonstrated in Table 7, all parties agree that the variable of “convenience” makes online learning attractive to all parties in our 24/7 world. The statement “easily accessing the syllabus and written instructions for assignments as needed” was ranked with moderate levels on both importance and satisfaction scales ( $M = 4.79, SD = .60; M = 4.53, SD = .67$ ) but it also had the largest discrepancy ( $M = -.26, SD = .95$ ). Because the rankings were in general quite high, we concluded the website was accessible, and the modular unit structure clear, but some room for improvement existed. The value “saving money on automotive expenses, including gas” was rated with the smallest discrepancy score between importance and satisfaction ratings ( $M = .05, SD = .82$ ). We concluded that working at home or on a laptop anywhere is important to the students and that we had succeeded for the most part in facilitating that practice.

**Table 7**  
**Differences between perceived importance and satisfaction**  
**with each statement of convenience**

Statement	Importance		Satisfaction		Difference <sup>a</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
9. Easily accessing the syllabus and written instructions for assignments as needed	4.79	.60	4.53	.67	-.26	.95
8. Choosing the amount of time I work online as my other class requirements demand	4.77	.75	4.65	.65	-.12	.50
5. Saving money on babysitting fees	4.23	1.02	4.35	.57	.12	1.07
7. Being able to work on assignments at any time, day or night	4.88	.39	4.79	.41	-.09	.53
6. Saving money on food	4.21	.64	4.30	.83	.09	.84
1. Being able to complete classwork at home, office, etc.	4.81	.45	4.77	.48	-.05	.69
4. Saving time from commuting	4.53	.55	4.58	.59	.05	.65
3. Saving money on automotive expenses, including gas	4.49	.83	4.53	.67	.05	.82

Note .  $N = 43$ ; <sup>a</sup>Difference scores were calculated by subtracting the importance scores from the satisfaction scores for each statement.

Some might argue that the only variable data that might be considered as “statistically non-significant” in our approach was that relating to the “convenience” value. Some positive mean differences were indeed revealed. For example, the statements - “saving money on babysitting fees” ( $M = .12, SD = 1.07$ ), “saving money on food” ( $M = .09, SD = .84$ ), “saving time from commuting” ( $M = .05, SD = .65$ ), and “saving money on automotive expenses, including gas” ( $M = .05, SD = .82$ ) received positive mean differences in importance and satisfaction ratings, indicating students' expectations about good distance learning programs are high but usually well-met. “Being able to work on assignments at any time, day or night” was rated as the value with the highest mean scores both in terms of importance and satisfaction ( $M = 4.88, SD = .39; M = 4.79, SD = .41$ ). The other ideas followed with the lowest mean scores in both categories: “Being able to complete classwork at home, office, etc.” ( $M = 4.81, SD = .45; M = 4.77, SD = .48$ ); “Saving money on babysitting fees” ( $M = 4.23, SD = 1.02; M = 4.35, SD = .57$ ); and “saving money on food” ( $M = 4.21, SD = .64; M = 4.30, SD = .83$ ). This data shows that we do well what so many others have mastered recently, and the students have “life-style” concerns which we all are meeting in helpful and productive ways.

## Discussion

When we compared the grand mean scores of “perceived importance” with those relating to “learning experience satisfaction,” we were able to target topics and areas that helped us modify our online course design. The research revealed that the majority of students surveyed for this study were satisfied with the approach to online learning as the delivery vehicle for a Research Methods Course. In other words, students appreciate the values and techniques associated with online learning and consider them appropriate to Graduate work. Indeed, a real majority of students surveyed for this study preferred online course work to conventional "face-to-face" classroom instruction. With a strong voice, the students disagreed with the statement “I would not have taken an online course if there had been some other means of receiving credit” that was included in the profile data. Students were most satisfied with the convenience component of our program. Many students choose online distance education programs because of the personal flexibility such courses offer. Online education’s main advantage is its ability to liberate students from time constraints and geographical distance problems (Caverly & MacDonald, 1999; Fisher, 2003). Another advantage of online learning is that it allows a student to progress at his/her own pace (Nguyen & Kira, 2000). The participants agreed with these benefits of this modern technology.

The demographic information about students in this study reflected typical characteristics of online learners who are full-time or part-time students living at a significant distance from their school campus. Since the majority of students in this course were employed many hours during each week, and more than half of the students also lived a considerable distance from campus, both statements “being able to work on assignments at any time, day or night” and “being able to complete classwork at home, office, etc” were vitally significant to them and resulted in the highest student satisfaction rating as we might expect.

According to the information obtained from the profile data, most of the students in this study had positive experiences with online learning. Some reasons for this attitude appeared to be that they were highly motivated, they were confident about their ability with computers, and they did not feel isolated when working online - many even prefer working alone on projects. In general, the success of online courses does require a high degree of self-motivation and self-direction (Bocchi, Eastman & Swift, 2004; O’Lawrence, 2006; Palloff & Pratt, 2003). Ng (2005) stated that “Online instruction requires the students to be very motivated to get onto their computers and do the required work at the appropriate times. Students who are not self-motivated will not do well in the online course setting” (p. 67).

Despite having quite positive attitudes about online learning, the vast majority of students participating in this study agreed that “getting a good grade is not easy in an online course” and rated “passing the class” quite low on the satisfaction scale, yielding the largest differential between importance and satisfaction ratings. This “gap” indicated that uncertainty existed about the quality of their work, our feedback methodology, and our approach to assessment of their work. Students did feel very satisfied about “gaining knowledge of the content” and this sense of achieving some content mastery was supported by the responses to the statement “I learned less than I expected from online courses” in the profile data. Seventy-seven percent of students disagreed with that statement. Consequently, it is clear that even though the majority of students surveyed in this study expected to pass the class, they did believe that getting a good grade was not that easy, they did feel quite satisfied with the actual core content they learned, but they were somewhat dissatisfied by the methods we employed to clearly articulate their levels of achievement. Consequently, we have been redesigning the structures of the course modules and our methods of communication with the students.

With regard to “student support,” the majority of students in this study saw “encountering few or no technical difficulties” as well as the “reliability of the server and/or equipment” as the most important components in the success of any online learning process. The study suggested that technical problems continue to be a real issue for some students, although most students claim to be quite comfortable when working with computers. It is obvious that students want to participate in online learning but do not want to waste time because of serious technical difficulties and related problems. “Readily available and appropriate technical assistance” was the one factor in our study where some signs of student dissatisfaction were evident. This data indicated a high differential between importance assigned and satisfaction experienced by students. Online learning, by its nature, requires students to be able to master rather basic applications of technology prior to enrolling in the course. But, some students do lack the necessary technical skills - emailing, downloading and opening files, viewing video clips using Flash and Quicktime, and downloading and listening to a podcast using iTunes. Qureshi (2004) suggested that “Using the computer as a learning mode requires new strategies and skills that cannot be taken for granted. Therefore, technical advice and support needs to be provided not only initially, but as an ongoing measure” (p. 157). For the ready availability of technical assistance, the “office hours” of an “ITS HELP DESK” need to be extended for evenings and weekends. Online course orientation video clips and brief tutorial video clips can be used in the online course management system.

Most of the students reported they did continue to develop their own written communication skills throughout this course. One positive aspect of a typical online format is that it generally does require substantial amounts of formal writing, often on a daily basis. The statement expressing “improvement in my written communication skills” in the variable of communication had the lowest importance rating, but a relatively high satisfaction rating. The students experienced an important advancement in their writing skills that was clearly beyond their expectations. We have kept this significant benefit in mind as we have designed new writing prompts and thought - provoking questions each new semester.

In addition, most of students in the study stated that they had a meaningful and satisfactory interaction with their course instructors. In particular, with regard to the statements associated with feedback from faculty to students - “receiving timely feedback about my progress from the instructor” and “getting personal feedback from the instructor,” both were rated with the highest mean score in terms of importance and learning experience satisfaction. Students wanted to and expected that they would receive feedback from their instructors to their questions, assignments, and discussion postings, and that this would be done in a timely manner. According to Howland and Moore (2002), “Some students expect immediate feedback in online courses because they have the perception that the instructor is readily available, regardless of the day and time” (p. 191). This result was congruent with the findings that showed the students had a high level of agreement to the statement made in the profile data survey: “I do not like having to wait for the instructor to respond to my e-mail.” Consequently, we are working to improve the online procedures to facilitate improved communication with the students.

The statements regarding student to student contact including “quantity of student-student interactions” and “quality of student-student interactions” were rated the lowest on the satisfaction scale. Weekly discussions were conducted on the discussion board within the online course and their purpose was to provide more opportunities for students to develop collaborative partnerships within the online learning course structure. But our results showed that students showed little satisfaction in these possible interactions. Accordingly, the instructor/researcher was challenged to structure the course in new ways that might promote intensive and fruitful interactions among students. Some components of the program such as small group discussion, an increase in the weight/value of the discussion board, some open-ended questions designed to elicit discussion rather than simply to earn points, and even simple “chat sessions” - all have been

considered as appropriate means to stimulate students' interactions with one another. Swan et al. (2000) found active interactions between student and student during online courses often results in collaborative learning efforts which enhances understanding and adds to more relevant and meaningful learning experience.

With regard to the "emotional health" variable, while students ranked "being mentally prepared for taking tests online" as being of great importance to them, they also implied they experienced only a moderate degree of satisfaction in this regard. They accepted the idea that a student's success in the tests is made possible through effective instruction by the faculty. But students also acknowledged that they have a responsibility to be well-prepared to take online tests and to engage carefully in the online discussions and various activities designed by the course instructor. Topics and assignments for weekly discussions were directly related to the material on mid-term and final exams. If students had diligently completed these weekly assignments by referencing the textbook and course lecture material, they might well have been better prepared for formal examinations. "Having confidence in submitting my work online" was rated highly on both the importance and satisfaction scales within this emotional health variable. The most plausible explanation for this finding might be that most students had indeed become accustomed to online learning but still needed to be thorough and careful as they worked their way through the various modules.

In conclusion, because of the unique nature of an online learning experience, and the unique personality of an online learner, it is important that we continue to study the "online experience" from the students' perspective. Consequently, validated information about the levels of assigned importance by the students themselves and their levels of satisfaction with the course learning experience can provide any instructor/researcher with quite useful insights that will help him/her refine his course design and instructional methodology in very practical ways. Certainly, we see that further research in diverse online course designs and implementation using a similar survey to measure the consistency of the congruency of student expectations and satisfaction levels may well prove to be a necessary tool helping us to understand the evolution of distance learning.

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**Editor's Note:** This is detailed, innovative research in effective distance learning. The results are somewhat disturbing to those of us committed to the success of the distance learning format.

## **Effects of a Blended Learning Strategy in Teaching Vocabulary on Premedical Students' Achievement**

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### **Abstract**

The current study aimed to investigate the effects of a proposed blended learning strategy in teaching medical vocabulary at Arabian Gulf University (AGU) on pre-medical students' achievement.

The study sample consisted of 50 students who scored less than 60% in AGU English Language Entry exam. The sample was randomly divided into two groups; 22 students in the control group and 28 in the experimental group. The research instrument was the AGU English language unit exams in English 151.

Data analysis revealed that there were no statistical significant differences between the experimental and the control group except with regard to the second midterm exam total score where the control group performed significantly better than the experimental group. It was argued that students' lack of vocabulary improvement was due to lack of administrative support.

**Keywords:** students' achievement blended learning, vocabulary, virtual learning environment, WebCT.

### **Introduction**

Media has been used in all phases of teaching and learning processes. Usually media is employed to reduce the burden of transferring knowledge from the teacher to his/her students. There are many types of media such as: books, audiotapes, video tapes, television programs and computer that the language teachers can use to facilitate learning to their students. If the medium is well planned, designed and utilized, it can positively affect students' learning and can be a source that helps the students to learn independently; therefore students can build their own knowledge and learning experiences.

Much research and many studies proved that using technology, as a delivery medium, in transferring knowledge, has many benefits over face-to-face instructions (Naqvi, 2006). More and more educators realize the benefits of the Internet in teaching and learning a second language (L2). Virtual learning environments have been created to make use of the Internet's advantages while controlling the learning process. Virtual Learning Environment (VLE) refers to a system of learning management in which students and their tutors participate in online interactions of various kinds, including online learning (Poulter, and Chalmers, n.d). VLE has enhanced interactive education over the web (Ahmad, Edwards, & Tomkinson, 2006). Examples of VLEs are: Web CT, Blackboard, Moodle, E-college, Learning space, and Angel (Frey, 2005).

Using VLE has many advantages as Henderson, 2001, believed: (1) minimizing traveling to attend classes; (2) students absorb the material in smaller portions, and (3) the information is easy to update and learning is possible 24/7 hours per week (cited in: Mackay & Stokport, 2006). The disadvantages of VLE have been investigated by many researchers. Bleimann (2004) saw delayed feedback due to the unavailability of the teacher when needed, as a disadvantage. Piskurich (2006) asserted that this type of learning requires more time from the teacher in designing the

course, and monitoring discussion boards, and students may not learn anything from the discussion boards or chat rooms.

This is why some educators believe that the best compromise between online learning and traditional learning, that has face-to-face (f2f) interaction and immediate feedback, is the use of blended learning. Bersin, 2004, observed that blended learning programs obviate the failure of online learning (Cited in: Mackay & Stokport, 2006). Blended learning can motivate the student to be an independent learner by doing activities that extend the class experience to increase his/her achievement (Paine, 2003).

### **Statement of the problem**

There is an acceptance of the notion that using the Internet in general and the virtual learning environment (VLE), particularly in combination with f2f learning, show a benefit. But when searching through available research reports, very few studies in the Gulf region have been done that support such a belief – especially in regards to using blended learning to enhance learning English as L2. In addition to that, blended learning is used in several universities in the Arab World as a supplementary tool but not as an integral part of planned instructional design. The Arabian Gulf University has a Virtual Learning Environment (VLE), WebCT, but few courses make use of it. In this study, the researcher examined the benefit of WebCT in developing the students' learning new vocabulary.

The main problem facing premedical students, similar to that of other foreign language students in learning a second language (L2), is that they have limited vocabulary. It would be an advantage if WebCT, with its different types of media and communication tools, could help them to learn the required technical vocabulary. This study set out to show that by using the additional support of WebCT, students could acquire comprehension of the new technical terms easily and effectively.

The research question is:

What are the effects of the proposed blended learning strategy in teaching vocabulary in the English 151 course on premedical students' achievement in comparison with the face-to-face method?

### **Hypothesis of the Study**

This study aims to validate the following hypothesis:

“Using the proposed blended learning strategy in teaching vocabulary in the English 151 course affects positively the students' achievement.

### **Limitations**

The results of the study can only be generalized within the following limitations:

- The human limitations: the premedical students;
- The place limitations: The College of Medicine and Medical Sciences at Arabian Gulf University (AGU) in Bahrain;
- The time limitations: the first semester of the academic year 2008;
- The course limitations: the English 151 course.

## Literature Review

The topics of this part will review literature relevant to the present study. The presentation covers: using technology in language learning; blended learning; teaching second language vocabulary; and WebCT and English language teaching.

### ***Using Technology in Language Learning***

Learning the English language is very important, because English has become a major means of communication all over the world (Tsai, 2006). It is the language of science, globalization, commerce, trade, politics, history, education, media and technology (Al-Nafisah, 2001).

Concerning the Gulf area, students face many problems in learning English which are similar to those of other English as Second Language (ESL) students. Fu (2003) believed that students, for whom English is not their first language, have difficulties in understanding academic papers and technical reports, problems in communication with foreign professors, limited vocabulary, and poor reading abilities. Al-Nafisah (2001) noted that Arab students face many problems in learning English. For example, they lack the opportunity to practice the language outside of classrooms and the classes; the text books; the topics of the English syllabus and the learning activities in the English class are boring and not related to the students' concerns and interests.

Some English students may be shy and the teacher in the classroom has a dominant role, which can hinder students' participation. All of these factors create passive students, and as many studies emphasized, students must be involved in the learning process. To improve English as a second language (ESL) learning, it is necessary to incorporate suitable types of technology in teaching English and students must be enabled to use technology and have access to technology-based flexible learning environments.

One of the recent uses of technology in education is using the internet. This kind of instruction is called "Online Learning". Studies have been done to analyze the advantages of online learning. Al-Mobark's (2003) study reported on research such as Al-Oud & Al-Hamed, 1424 /2003; and Al-Rashed, 1424/2003, which favored online learning because it gives students a sense of privacy when they make mistakes and it uses a variety learning aids, multimedia and audio and video clips to develop a student's thinking skills. Piskurich (2006) believed that online learning saves the time and the costs of traveling if the university is far away; uses different methods for reinforcement and it helps in retention by replicating the activity or the information presentation. Online learning also produces collaborative learners who can learn in groups (Piskurich, 2006).

The disadvantages of online learning have been investigated by many researchers. Bleimann (2004) saw delayed feedback due to the unavailability of the teacher when needed, as a disadvantage of online learning. Piskurich (2006) asserted that online learning requires more time from the teacher in designing the course, and monitoring discussion boards, and students may not learn anything from the discussion boards or chat rooms. Online learning does not have f2f interaction which may decrease students' motivation to learn (Mackay & Stockport, 2006) and may also increase the student's feeling of isolation.

### ***Blended Learning***

As presented previously, many researchers have discussed the advantages and disadvantage of online learning. So it seems that it would be an ideal strategy if the benefits of this type of instruction could be successfully combined with face-to-face learning (f2f) through a blended way of learning. Blended learning is a learning approach that is also known as "hybrid learning" in which f2f teaching would be integrated with online learning (Thompson, 2003).

Duhancey, 2004, defined blended learning as a course that comprises any combined use of electronic learning tools that supplement, but do not replace f2f learning (Cited in: Welker &

Berardino, 2006). Sahin (2007) defined blended learning as kind of distance learning that is used to support f2f learning. These two definitions of blended learning are the most suitable ones in regards to the type of learning used in this study.

From reviewing the related literature, many studies have proved the success and the advantages of blended learning over online and f2f learning alone. In blended learning, the student can learn from an online course that matches his/her different learning styles, and at the same time, students can learn from lectures in class (Osguthrope & Graham, 2003). In blended learning, a student can also learn from social interaction, whether f2f or online, and gets immediate feedback (Osguthrope & Graham, 2003). Through blended learning the student's achievement is higher because retention of the learning material is increased through the use of media and VLE tools (Thompson, 2003). Moreover, in blended learning the student is actively involved in the learning process (Thompson, 2003) and has access to different online resources (Osguthrope & Graham, 2003; Lim, Morris & Kumpitz, 2006).

Many studies focused on the learning outcomes of blended learning. Echavez-Solano (2003) found that the students in technology-enhanced classes had better understanding of course content, immediate feedback, self learning and control of their learning. However, Echavez-Solano (2003) observed that there were no significant differences between students' performance in traditional classes and technology-enhanced classes (blended) in the assignments, exams and final grades.

It is clear from reviewing the literature that blended learning tends to be better than online or f2f instruction alone. However, students who learn by this approach of instruction may not achieve significantly better results than those studying f2f or online courses only. Additionally, English language is one of the courses in which students need the teacher's presence in guiding them in the different language skills that they learn.

### ***Teaching Second Language Vocabulary***

The English language, like any other language, has different areas that students should study: vocabulary, grammar, spelling, listening and reading. In this study, the researcher focused on vocabulary because of its importance to premedical students. This is an area which has been somewhat neglected in past research.

Vocabulary is a building block of all language skills: reading, listening, writing and speaking (Lin, 2002). Asselin (2002) and Nichols & Rupley (2004) emphasized the importance of vocabulary, stating that it is a key to reading comprehension, reading fluency, writing, and communication with others. Mastering vocabulary enables students to form sentences and communicate with others.

Therefore, due to its importance, adequate support is essential in learning vocabulary. Necessary support in learning vocabulary can be provided through the use of internet and Virtual Learning Environment (VLE) tools because, as discussed earlier, this has positive effects on second language learning. The results of Lin's (2002) study that aimed to provide guidelines for supplemental Websites for English as a foreign language (EFL) vocabulary acquisition indicated that most of the respondents considered learning vocabulary difficult. He explained that students favored the interactive, supplemental course website to learn the target vocabulary because it provided vocabulary practice and regular vocabulary assessment.

Many studies proved the positive effects of supplementary programs in teaching ESL. Carlo (et al) 2004, showed that a supplementary program which requires students' active engagement in learning new words, has a significant statistically positive impact in EFL on vocabulary knowledge (Cited in: Apthorp, 2006). Siekmann (1999) found that the supplemental online learning environment is a useful tool from both the student's and the instructor's perspectives and

it should be used in second language classrooms. Kaya (2006) reviewed the studies of Chennault, 1993; De Ridder, 2000; Horst, Cobb & Nicolae, 2005. Kaya (2006) concluded that the online programs should be used as a tool for learning vocabulary because they offer rich input and encourage deeper processing and they have a significantly positive effect on vocabulary.

Chennault, 1993, conducted an experiment in which the experimental group was provided with online support and multimedia in learning L2 vocabulary. The experimental group performed significantly better results in vocabulary than the control group. Also, De Ridder, 2000, findings indicated that CALL and hyperlinks positively affect the students' reading comprehension and vocabulary acquisition. Horst, Cobb & Nicolae, 2005, findings indicated that the created website that was designed to support vocabulary acquisition and contained dictionary, hypertext, and interactive self quizzing feature, resulted in deeper processing of language for the L2 learners (Cited in Kaya, 2006). Iddings, Ortmann & Pride's (1999) study examined the effectiveness of a program designed to enhance students' reading comprehension and vocabulary development through the use of multiple instructional strategies and technology. The study proved that the use of technology and multiple instructional strategies in teaching vocabulary resulted in a significant growth in vocabulary development for students.

However, it is worth mentioning that some studies like Kaya's (2006) did not prove significant growth in the students' vocabulary acquisition due to the use of the supplementary vocabulary programs. Kaya's (2006) study, investigated the effectiveness of adaptive computer use for learning vocabulary on learning behavior on a sample of 200 students in Fukuoka University of Education in Japan. This study showed no significant differences between the group that used the computerized vocabulary instruction and the other group that did not use the program.

### ***WebCT and English Language Teaching***

Educators can implement blended learning in language learning through the utilization of VLE (Virtual Learning Environment) as a supplementary means to help the non-native speaker in developing his/her language and his/her skills. VLE contains activities, audio and video clips, animation and graphs which can help reinforce new learning so the student develops his/her oral and aural skills (Paine, 2003).

Virtual learning environments are low in cost in comparison with the costs of traditional learning such as the costs of buildings, labs, transportation or school equipment. Moreover, a large number of students can enroll in the same course from different geographical areas and different time zones as Besyony, 2000, explained (Cited in: Al-Mobark, 2004). VLE and the Internet in general, combine the benefits of ordinary book learning with the benefits of audio and video clips (Bates & Poole, 2003/2006). Web Course Tools (WebCT) is a VLE that offers a number of tools that enable the instructor to meet students' needs and decrease the teachers work (Siekmann, 1998). These include the following:

- Tracking students;
- Automatic grading of quizzes;
- Monitoring discussion;
- Arranging the course and the content easily;
- Providing authentic material and different resources for information for the students (clips, websites, etc.);

Lai & Kritsonis (2006) showed that WebCT helps the student in learning by repeating the lessons if required. As with any VLE, WebCT enables students to communicate with other students and with their instructor through different communication tools and increases the opportunities for them to be independent and self-directed (Thomas & Storr, 2005). It helps those students who do

not participate in classroom activities (Meskill & Mossop, 1997). This enables students to build and promote their knowledge. WebCT enables students to get immediate, high quality feedback from the instructor for their discussion contributions and assignments (Lai, 2006)

Many studies provided evidence for the positive effects of WebCT on achievement. Naqvi's (2006) study aimed to explore the feedback of 71 students on the use of the WebCT, and its impact on their learning of the course material. The study found that the use of WebCT helped the student to understand better and learn the course material in an effective way. Thomas & Storr (2005) emphasized this when they found that for 82% of students their learning of content increased. Seikmann's (1998) study was one of the few studies about integrating WebCT in L2 learning. These findings indicated that WebCT brought L2 learning to the students' homes and encouraged the students who did not participate in class to use the language in communicating through the communication tools.

### **Summary**

From reviewing the literature relevant to the current research, the following are concluded:

- Most studies that were reviewed focused on the effects of the online units designed to teach L2 vocabulary on the students' achievement.
- It is very important to choose the suitable learning strategy and to design a well planned online unit on VLE to teach second language vocabulary and help the students to be independent learners.
- The researcher benefited from the relevant studies that designed online units to enhance L2 vocabulary in designing the online unit, multimedia, and the VLE tools to enhance the vocabulary acquisition of the premedical students.
- Kaya's (2006) study is the most similar study to the current study in the design of the online units and using WebCT to deliver the units to improve the students' vocabulary acquisition. Kaya's (2006) online unit contained text, images, movie, and audio in order to facilitate the vocabulary learning process like the online unit used in the current study.

### **The Research Methodology**

The study used the experimental method to achieve its purpose. The design of the research was a true experimental one because the students were assigned to two groups randomly. The students' achievement hypothesis was tested by a randomized posttest control group design. This included 3 measurements; two midterm exams and the final exam.

#### *Participants*

The sample was made up of 50 students, all nominated by the English Language Unit. These students were assigned to the experimental and control groups through random selection from a list. The sample contained 15 males and 35 females. The mean of the sample on the English language Entry Exam was 39.5. This was low and it was clear that this group needed assistance. The researcher divided the sample into 28 students in the experimental group and 22 students in the control group expecting students from the experimental group to leave the online unit since they did not have motives to study the online unit as will be explained in a subsequent section.

#### **Instrumentation**

##### *The Online Unit:*

In this study, the experimental method was used to assess the effects of the blended way of learning vocabulary within English 151 course for the AGU premedical students. The

researcher's role in the online unit "Medical Vocabulary" was as a co-teacher who designed the online unit and helped the students learn from the unit.

The online unit was designed as an extension to the course outside the class. This unit contained WebCT tools, multimedia, electronic interaction and access to websites. All these were over and above the information the students were given in the f2f sessions to enrich the course - particularly vocabulary.

### Research Problems

1. The unavailability of the Internet in the students' dorms at the beginning of the course. This was solved after 3 weeks by providing a wireless network.
2. The low reward from the AGU's English Unit to the students who enrolled in the blended course. The English Unit offered a reduction of just four Self Access Center (SAC) hours to students who participated in the Medical Vocabulary online unit. Students in the control group had a reduction of two hours from the SAC. So the students in the experimental group felt that there wasn't much to lose if they didn't study from WebCT. This meant the students had minimal external factors to motivate them to study. The researcher tried personally to convince them to study and to motivate the students through the improvement they will see on their exams. Some students came to know from the English 151 teacher that just doing the assignments and the quizzes would enable them to be awarded the four SAC hours - even if they did not take full marks in WebCT.
3. The non-cooperation of English 151 course teacher. She did not access the WebCT, read the learning material, or contributed in answering the students' questions through email.
4. Through the WebCT tool "Track Students," the researcher noticed that some students did not read all the pages in the unit and didn't take enough time in studying the lesson. A few students did not study at all. The researcher sent emails to them requesting that they study appropriately, otherwise marks would be deducted.

### Data Analysis and Results

This section presents the results of the statistical analysis of the data collected as part of this research study. Prior to testing the hypothesis, the researcher tested the differences between the experimental and control groups in the English Entry exam scores. The difference between the two groups was not statistically significant (experimental group:  $M = 38.4$ ,  $S = 10.6$ ; control group  $M = 41.2$ ,  $S = 12.0$ ,  $t = 0.844$ , and  $p = 0.403$ ). So the two groups were equivalent with regard to the English Entry exam.

#### **Results Related to the Hypothesis**

The hypothesis states that: "Using the proposed blended learning strategy in teaching vocabulary in English 151 course affects the students' achievement." The students' achievement was assessed via three measures. These measures were two midterm exams and a final exam. For each measure, two scores were recorded, the score obtained on the vocabulary questions and the total score. Accordingly, the following six achievement scores were recorded: (1) first midterm vocabulary score (MT1VOC), (2) first midterm total score (MT1TOT), (3) second midterm vocabulary score (MT2VOC), (4) second midterm total score (MT2TOT), (5) final vocabulary score (FINVOC), and (6) final total score (FINTOT).

Since there were six dependent achievement variables, the hypothesis was tested via MANOVA. MANOVA was used to test the mean differences for the vocabulary and total scores separately. MANOVA requires that the dependent variables be normally distributed with equal groups' covariance matrices. Since the sample sizes for each group was less than 30 (28 students in the

experimental group and 20 students in the control group), it was necessary to assess the normality of achievement scores within each group. Table (1) shows the results of the Shapiro-Wilk test. It is clear from this table that the normality assumptions were not satisfied in nine statistical tests. These were the tests related to MT1VOC, MT2VOC, and FINVOC for the experimental group, and the tests related to MT1VOC, MT1TOT, MT2VOC, MT2TOT, FINVOC, and FINTOT for the control group

So the normality of the scores seemed to have been violated. But the equality of the covariance matrices was not violated. Box's test of the equality of the covariance matrices for the vocabulary variables indicated that the differences in the matrices were not statistically significant ( $F = 1.971$ ,  $df_1 = 6$ ,  $df_2 = 8739.9$ ,  $p = 0.066$ ). For the total variables, Box's test also indicated that the covariance matrices were not statistically significant ( $F = 10.110$ ,  $df_1 = 6$ ,  $df_2 = 8739.9$ ,  $p = 0.157$ ). Thus it can be assumed that the covariance matrices of the two groups were equal. However, since the normality assumptions could not be accepted, the researcher decided to use both the parametric and non- parametric procedures.

The MANOVA Test for the differences on the vocabulary variables indicated that the experimental and control groups means were not significantly different ( $F = 0.532$ ,  $df_1 = 3$ ,  $df_2 = 42$ ,  $p = 0.663$ ). Similarly, for the total scores, the means were not significantly different ( $F = 1.574$ ,  $df_1 = 3$ ,  $df_2 = 42$ ,  $p = 0.210$ ). Table (2) shows the mean and the standard deviation for each of the six achievement measures. It can be seen that the means of the two groups relative to the standard deviation are very comparable.

**Table 1**  
**Shapiro-Wilk Test for Assessing the Normality of Achievement Scores**

	Group	Statistic	df	<i>p</i>
MT1VOC	experimental	.824	28	.000
	Control	.656	18	.000
MT1TOT	experimental	.959	28	.333
	Control	.785	18	.001
MT2VOC	experimental	.890	28	.007
	control	.766	18	.001
MT2TOT	experimental	.952	28	.219
	control	.760	18	.000
FINVOC	experimental	.885	28	.005
	control	.719	18	.000
FINTOT	experimental	.930	28	.063
	control	.775	18	.001

The non-parametric test used was the Mann-Whitney Exact test. Table (3) shows the results. According to this table, the only significant difference at the 0.05 was related to MT2TOT ( $p = 0.049$ ). As the mean rank in table (3) and the means in table (2) show, the control group performed better than the experimental group in this test. Additionally, tables (2) and (3) indicate that the scores of the control group on the other measures tended to be higher than the scores of the experimental group though the mean differences were not significant.

**Table 2**  
**The Mean and the Standard Deviation for Each Group**

The Test	Group	Mean	Std. Deviation
MT1VOC	experimental	24.1071	4.96489
	control	23.4750	7.42989
MT1TOT	experimental	72.9643	15.71693
	control	76.1000	21.51291
MT2VOC	experimental	29.4554	7.76002
	control	31.8375	8.94033
MT2TOT	experimental	75.3839	14.85804
	control	81.5500	17.77576
FINVOC	experimental	31.5179	6.75700
	control	34.0500	6.33889
FINTOT	experimental	76.1964	14.72720
	control	83.0875	14.24672

**Table 3**  
**Mann-Whitney Exact Test**

The Test	Group	Mean Rank	<i>p</i>
MT1VOC	experimental	22.89	0.351
	control	26.75	
MT1TOT	experimental	22.00	0.146
	control	28.00	
MT2VOC	experimental	21.89	0.129
	control	28.15	
MT2TOT	experimental	21.14	0.049
	control	29.20	
FINVOC	experimental	21.71	0.104
	control	28.40	
FINTOT	experimental	21.41	0.071
	control	28.83	

## Discussion Results Related to the Hypothesis

The proposed blended learning strategy used in the current study did not affect the students' achievement except with regard to the second midterm total score. However, in this test the control group performed significantly better than the experimental group. Possible explanations for the non-significant result related to achievement are:

1. Through tracking the students logs in the Medical Vocabulary lessons it was found that about one-third (29.5%) of the students studied all the lessons in the online unit, about one-third (28.5%) of the students studied some of these lessons (40%), and 42% of the students didn't study the lessons at all.
2. The researcher was unable to force the students to study the online lessons since the credit for the students was reducing 4 SAC hours and the students knew that they will gain this credit even if they did not study the online unit;
3. The students were not encouraged to study from the online unit by the English 151 teacher;
4. About forty-two percent of the students did the assignments and the online quizzes without studying from the online unit;
5. The students indicated that they had busy schedules and did not have time, especially that they considered this online unit an extra load since only 4 SAC hours were reduced.
6. The students were not used to being independent learners.

The non-significant result in distance learning literature is not uncommon. A general review of distance education studies is presented through a meta-analysis done by Bernard, Abrami, Lou, Borokhovski, et al. (2004) to determine the effects of distance education courses on achievement. Bernard et al. (2004) did a meta-analysis of 232 comparative distance education literature classes between 1985 and 2002. Bernard et al. (2004) found that there was a very small significant effect favoring distance education conditions over traditional education. This significant effect was positive in asynchronous settings and negative in synchronous settings. Bernard et al. (2004) concluded that distance education sometimes works extremely well and extremely poorly in other times, even when all study features are taken into account. This conclusion is in agreement with the findings of the present study.

The present study aims was to assess the effects of supplementary online unit on learning L2 vocabulary. The supplementary online unit of the present study did not impact the students' vocabulary acquisition. This finding of the present study was in agreement with the findings of Kaya (2006) that investigated the effectiveness of adaptive computer use for learning vocabulary. The present study is similar to Kaya's (2006) study where both online units contained texts, images, movie, and audio in order to facilitate the vocabulary learning process. Kaya (2006) argued that the non significant results were due to the problems faced by the researcher, such as to delay the posttest.

The finding of the present study was in disagreement with the findings of many studies' that indicated positive effects of supplementary online units such as: Carlo's et al., 2004, where the students' participation in the online unit impacted positively their comprehension and vocabulary knowledge (Cited in: Aphorp, 2006). Kaya (2006) reviewed different studies that used different online programs to develop vocabulary acquisition like Chennault, 1993, De Ridder, 2000, Horst, Cobb & Nicolae, 2005. Chennault, 1993, provided the experimental group with online support and multimedia in learning L2 vocabulary and these students achieved significant growth in vocabulary. Also, De Ridder, 2000, findings indicated that CALL and hyperlinks affected positively the students' reading comprehension and vocabulary acquisition. Horst, Cobb & Nicolae, 2005, findings indicated that the created website that was designed to support

vocabulary acquisition and contained dictionary, hypertext, and interactive self quizzing feature, offered input and language deeper processing for the L2 learners.

The Medical Vocabulary program did not improve the students' achievement in vocabulary. This result is also in disagreement with Iddings, Ortmann, and Pride's (1999) finding that showed that there was a significant growth in vocabulary development and reading comprehension through the use of multiple instructional strategies and computer technology in teaching. Iddings et al. (1999) saw the reason for the significant results was the use of self-selecting reading buckets.

## Conclusions

The purpose of this study was to investigate the effects of the proposed blended learning strategy in teaching vocabulary in the English 151 course on the premedical students' achievement in comparison with the traditional f2f method.

The findings of this study indicated that there were no significant differences between the means of the experimental and control groups in the achievement tests except with regard to the second midterm exam total score. However, in this test the control group performed significantly better than the experimental group. The results of this study indicated that the proposed blended learning strategy did not improve the students' achievement.

According to the reviewers, the unit was well designed. In addition, students, being poor in the English language, were in need of the help provided by the online unit. The above facts are not coherent with the relatively small percentage of students who made full use of the unit, and with the lack of improvement in achievement. It would thus seem plausible that the lack of support of the AGU English Language Unit was behind the failure to benefit from the unit. One may conclude that efforts and funds spent in developing e-learning materials would be fruitless without gaining support of the academic programs involved. In addition, students should be aware of the long-time benefits of using e-learning materials in that they help them in developing lifelong skills. These skills are emphasized in AGU's college of Medicine and Medical Sciences.

In light of this study's results, the following are recommended:

- AGU should encourage the teachers and professors to use the VLE by offering incentives.
- The educational institutions should provide the needed infrastructure to use electronic learning in education.
- The design of the English language curriculum should meet the students' needs and interests. There should be different learning aids that facilitate, motivate, attract the students' attention and help them to be independent learners.
- It is recommended to conduct similar studies in using the blended learning strategy in teaching English vocabulary with more control on the research settings.
- It is recommended to conduct similar studies in using the blended learning strategy in teaching English language skills: reading, comprehension, listening, writing, pronunciation, or grammar.

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## Appendix 1

# Reviewers

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### Panel Experts for the Online Unit:

1. Mrs. Ghada Abdullah, assistant teacher in the English Language Unit, Arabian Gulf University
2. Dr. Ali S. Al-Musawi, Assistant Professor, Head of Instructional and Learning Technologies Department, College of Education, Sultan Qaboos University
3. Dr. Akram Fathy Mustafa, Instructional Technology Department, South Valley University, Egypt
4. Dr. Zakaria Sorial, Learning Technologies Department, Almansorah University, Egypt
5. Dr. Jasir Alherbish, Engineering and Computer Science, the Chairman of the Committee on Education and Training Foundation Electronic Assembly for Technical Education Riyadh, Saudi Arabia
6. Mr. Hamed Kadry, Technical information, Information Technology Center King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia
7. Dr. Abdullah Almohaya, Technically learning, Teachers College, King Khaled University in Abha, Saudi Arabia
8. Dr. Awad Altwodry, Learning Technologies Department, King Saud University Riyadh, Saudi Arabia

## Appendix 2

### Online Unit Judgment Criteria

#### Criteria for Reviewing the Online Unit: *Medical Vocabulary,*

Following are the statements given to reviewers to evaluate the online unit that was designed to achieve the goal of the current research. The reviewers had to put a tick ( ✓ ) on the degree they judge the criterion ranging from 5 that is the highest mark to 1 the lowest mark. And write their comment if needed in the last column.

#### **These are the means of the reviewers' responses for each item in the Likert scale:**

No.	Item	Issues	Mean
1	Objectives	The objectives of the unit are clear	4.8
		The objectives of the each lesson are clear	4.8
		They are sufficient detailed	4.5
		The objectives vary on Bloom taxonomy	4
		The learners make use of them	4
2	Pre-requisites	I assume things that learners know	4.8
3	Unit structure	The unit structure is clear to the learners	4.7
		The learning material is well organized	4
		The site is easy to navigate	4.7
		The unit plan helps in introducing the unit for the students i.e. gives them idea about what is going to be studied	4.7
		<sup>a</sup> The CD is easy to use	4
		The instructions of using the site are clear	4.8
4	Unit content	The learners understand the function of each component (clips, links to websites, flashes, images, flash cards and power point presentations)	4.7
		The learners are able to use all the components in an effective way	4.7
		The unit content is achieving the aim of the unit that is (to help the premedical students in understanding, memorizing and applying the vocabulary in the future)	4.5
		The flashes illustrate the content for the students	4.5
		The power point presentations are used in their correct place	3.8
		The content of the CD is helpful in deepening the learners understanding	4
		The video clips are helpful for a better understanding of the lessons	4.5
		The websites are helpful for a better understanding of the lessons	4.6

		The audio and video clips are available	4.5
		The websites are available	4.6
5	Learning	The learners achieve the unit outcomes	4
		The learners achieve the lessons outcomes	4
		The site is suiting the learners' needs	4
6	Activities	The activities are connected to the objectives	4
		The activities are enough for the content	4.6
		The instructions for doing the activities are clear	4
		The feedback is helpful for the learners?	4.7
7	Self-assessment	The self-assessments enable the students to check their progress	4
8	Language	The language in the unit is clear	4.5
9	Pace	The unit is taking the needed time i.e. not too fast and not too slow	4
10	The assignment	The instructions for doing the assignment are clear	4
		The instructions for the way of submitting the assignment are clear	4.6

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**Editor's Note:** Global reach makes learning accessible across national and cultural boundaries. Language and cultural differences impact both ease of learning and learning outcomes where instruction is in a second language. This small sample experiment documents the challenges faced by Chinese students using discussion boards in western universities

## Chinese Students' Perceptions of Online Learning in Western Discussion Boards: A Cultural Perspective

Pao-Nan Chou and Wei-Fan Chen  
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### Abstract

The purpose of this study was to examine Chinese students' perceptions of online learning at asynchronous discussion boards at distance education programs in an American university. The study employed a phenomenological methodology to explore learners' lived online experiences in order to obtain in-depth understanding of any possible cultural challenges. Six Chinese students voluntarily participated in the study. Interviews with students were the primary data source. Data analysis showed that participants' cultural backgrounds indeed influenced their online discussions.

**Keywords:** asynchronous discussion board, qualitative study, Chinese students, phenomenological study, online learning, cultural challenges, non-native English speakers, interview technique, learning perceptions, web-based environments

### Introduction

When non-native English learners join the e-learning bandwagon, the online learning environment becomes a culturally sensitive setting (Gunawardena, Wilson, & Nolla, 2003), which leads to several criticisms of U.S. online education. For instance, Carr-Chellman (2005) contended current online education programs in America move toward colonization and ignore culture diversity. Wang and Reeves (2004) stated that a Western culture perspective dominates design principles of U.S. online courses, and awareness of minority cultures signore could be raised. Therefore, Gunawardena and LaPointe (2007) contended that the need to explore the cultural dynamics of online learning is crucial.

In the literature, a considerable number of studies endeavored to explore native English students' perceptions of online learning in the United States. However, little is empirically known about how non-native English learners engage web-based learning environments. Tu (2001), Ku and Lohr (2003), and Al-Harthi (2005) conducted several studies on how international students experience U.S. online education. In Tu's study, Chinese students' interaction models in the online courses were identified. In Ku and Lohr's study, Chinese students' attitudes toward their first online learning were examined. In Al-Harthi's study, Arab Gulf students' perceptions of U.S. online education were analyzed. However, future studies should concentrate much more effort on the above related topics.

To overcome the problems identified above, this study was designed to explore whether a cultural effect may post a challenge for non-native English learners in Western learning settings. A group of Chinese students who studied in an American university were the targeted non-native English learners. Asynchronous online discussions at schools' distance education programs were chosen as Western learning environments. Specifically, the purpose of this study was to examine Chinese students' perceptions of online learning through asynchronous discussion boards in distance education programs in an American university.

## Theoretical Foundations

Based on Hall's (1976) context model, different cultures can be grouped into two categories: low and high context. In high-context cultural environments (e.g. Chinese or Japanese), people have extensive information networks, such as colleagues and friends, to manage close personal relationships. While interacting with friends, they do not need much in-depth, background information since "...they keep themselves informed about everything having to do with the people who are important in their lives" (Hall & Hall, 1990, p.6). In low-context cultural environments (e.g. American or German), people "...compartmentalize their personal relationships, their work, and many aspects of day-to-day life... each time they interact with others they need detailed background information" (Hall & Hall, 1990, p.7). Applications of the context models in education are summarized in Table 1.

**Table 1**  
**Learning Perspectives in Hall's Context Models**

<b>Low Context Culture</b>	<b>High Context Culture</b>
Emphasis on learning outcomes: student-centered learning and active learning	Emphasis on teaching inputs: all materials provided in class and rigid parameters set in course syllabi
Emphasis on attitudinally-based deep learning: development of personal skills, and attitudes toward lifelong learning	Content- and knowledge-based learning: little emphasis on personal, transferable skills
Wide variety of learning tools and assessment instruments: assessment as feedback instrument and wide range of assessment/feedback tools	Individual and examination-based assessment: frequent, highly content specific assessment
Informal lecturer/student relationships: teachers as guides/facilitators/mentors in learning process	Formal lecturer/student relationships: students' performance depend on teachers' knowledge
Larger student numbers/more contact time: efficient use of teaching resources sought	Small group sizes/fewer contact time: intimate teacher/student relationship sought

Adapted from: Morse (2003, p. 42)

Hofstede (1991) analyzed 50 countries' worldviews and identified four different dimensions among those national worldviews: individualism vs. collectivism, large vs. small power distance, strong vs. weak uncertainty avoidance, and masculinity vs. femininity. By employing a dichotomous method, these four categories represent different cultural traits, showing each country's cultural values. For example, cultural values in America fit with individualism, small power distance, weak uncertainty, and masculinity. Like Hall's context model, Hofstede's four dimensions of national worldviews could also be applied to analyze cultural groups' learning styles (Williams-Green, Holmes, & Sherman, 1998). Definitions and pedagogical implications of the four dimensions are summarized in Table 2.

**Table 2**  
**Definitions and Pedagogical Implications of Hofstede's Four Dimensions**

Dimension	Definitions	Pedagogical Implications
1	Individualism: everybody is supposed to look after his or her own self-interest	Purpose of education is learning how to learn
	Collectivism: everybody looks after interest of his or her in-group and have opinions and beliefs of in-group	Purpose of education is learning how to do
2	Small power distance: authority decentralized and leadership more democratic	Teachers expect initiatives from students in class; teachers are experts who transfer impersonal truths; students treat teachers as equals
	Large power distance: authority more centralized and leadership more autocratic	Teachers are expected to take all initiatives in class; teachers are gurus who transfer personal wisdom; students treat teachers with respect
3	Strong uncertainty avoidance: society tries to beat the future, higher anxiety in people	Students comfortable in structured learning situations and concerned with the right answers; teachers supposed to have all the answers
	Weak uncertainty avoidance: society socializes members to accept uncertainty	Students comfortable with open-ended learning situations and concerned with good discussions; teachers may say 'I don't know'
4	Masculinity: traditional masculine social values permeate the whole society	Best student is the norm; failing in school is a disaster; brilliance in teachers appreciated
	Femininity: dominant values for men and women are those traditionally associated with feminine role	Average student is the norm; failing in school is a minor accident; friendliness in teachers appreciated

Adapted from: Williams-Green, Holmes, & Sherman (1998, p.7); Hofstede (1991, p. 37, p. 67, p. 96, p.125)

Based on the above theoretical foundations, this study perceives that since Chinese students participate in Chinese educational systems a long time before coming to American universities, previous educational values might unconsciously or indirectly influence their learning perspectives. Chinese students may bring certain learning traits, identified in Hall and Hofstede's models, into a new learning environment (i.e. the American university).

## Research Method

### *Research Participants*

Total of 5 female and 1 male voluntarily participated in this study. The sample size satisfies the phenomenological requirement that at least six individuals who all have experienced the phenomenology should be interviewed (Morse, 1994). All participants are Chinese graduate students enrolled in the College of Education in a large state university in the Northeast America.

The online courses they took were all offered by the same university. They came to America to pursue their doctoral degrees after receiving bachelor or master degrees in Asia. Mandarin is their mother tongue. They all passed the English proficiency tests (e.g. TOEFL and GRE) to fulfill the graduate school's requirement. Table 3 shows their basic profiles.

**Table 3**  
**Basic Profile of Each Participant**

Pseudo Identity	Gender	Age	Degree Seeking	Number(s) of Online Graduate-level Course(s) taken before this study	Major
P1	F	27	PhD	3	Adult Education
P2	M	37	PhD	1	Educational Technology
P3	F	33	PhD	1	Curriculum & Instruction
P4	F	36	PhD	2	Curriculum & Instruction
P5	F	29	PhD	1	Curriculum & Instruction
P6	F	25	PhD	1	Curriculum & Instruction

### **Research Design**

This study employed a phenomenological methodology to explore learners' perceptions and online experiences in order to obtain more in-depth understanding of any possible cultural challenges learners might encounter during their participation in online discussion activities. According to Van Manen (1997), "the aim of phenomenology is to transform lived experience into a textual expression of its essence..." (p. 36). Van Manen further claimed that "... the task of phenomenological research and writing: to construct a possible interpretation of the nature of a certain human experience" (p. 41). The purpose of this study fits well with Van Manen's statement because it seeks to understand learners' experiences in online courses and further interpret non-native English learners' perceptions of online asynchronous discussions.

Based on literature review and the researchers' personal experiences, a semi-structured interview guide (see appendix) was developed. With regard to the design of interview process, this study applies Seidman's (2006) three series of phenomenological interviewing: focused life history, the details of present lived experience, and reflection on the meaning of experience with minor modification. In order to match with participants' schedule, the three series of interviewing were condensed into a 90-minute interview with each research participant. During interview process, observations on participants' archived discussion boards were another data source to verify participants' sayings.

After data collection, Moustakas's (1994) method of phenomenological analysis was employed to analyze all written transcripts. First, significant phrases or sentences were identified (preliminary grouping). Second, meanings were formulated from significant phrases or sentences (clustering of invariant meaning units). Third, the formulated meanings are clustered into different themes (searching for themes). Finally, exhaustive descriptions of each theme and overarching

interpretation of essences of the experiences were provided (composite textural-structural descriptions).

### ***Validity and Reliability***

In order to increase validity and reliability of this study, a number of techniques were employed. For validity, this study conducted triangulation, peer review, and member checking suggested by Cresswell (2007). In triangulation, multiple sources, such as observations on participants' archived discussion boards and in-depth interviews with participants, corroborate evidence. For peer review, several colleagues continuously questioned research design to increase the research quality. As for member checking, once interpretative data was obtained, some participants reviewed the data for the second time to validate the findings. Concerning the reliability, the researchers not only employed a high quality of digital devices to record interview conversation, but also requested one colleague to verify the accuracy of interview transcripts.

## **Results**

The interpretation of participants' transcribed interview data resulted in ten findings. Representative quotations from participants were inserted in each finding.

### ***1. Gender confusion***

When encountering uncommon first names, few participants were sometimes unable to identify their peers' genders. P1 stated,

“Sometimes, I confused with my classmates' gender in online discussions. I can easily identify popular English names, which tell me the difference between male and female. But for unpopular ones, it is much difficult for me to tell the difference.”

A male participant (P2) had the same feeling as P1's when he sent an e-mail to his online classmates. He said, during group project development, e-mail was a preferable communication channel. One of my team members corrected my writing in an e-mail. My classmate told me

“I used wrong gender pronoun. I was so embarrassed when I realized she is not he.”

### ***2. Respect for teacher's role***

All participants strongly respected the teachers. They followed what their teachers required for the course work and did not challenge the teachers' viewpoints. P3 said, " My culture background tells me that I should show a great respect to my teachers even though I have been U.S. for a long time". P6 expressed a similar thought when talking about his course requirements. He stated, " Whatever online instructors said, I would definitely follow their rules. Although sometimes course requirements they set did not make sense to me, I still respect what they did and did my best to meet their needs. P5 also showed a great respect for her online instructors. She said, " Usually, I disagreed with my teachers' comments. However, Chinese culture put down my desire to challenge their (teachers) viewpoints".

### ***3. Non-critical expression style for postings***

When compared with their Western fellow students, some participants perceived that their expression styles in discussion board were non-critical and euphemistic. P1 stated:

"I wanted to create a harmonious learning environment. I think critical arguments will lead to a tense environment, which discourages people's responses. So, I often complimented on my classmates' postings. For example, I will not directly point out which one (sentence or paragraph) is wrong or right. I will write some complimentary words first and then indirectly tell what I thought in each posting".

P6 thought direct argument would embarrass her classmates. She stated,

"When I composed my response postings, I would try to soft the tone of my writings. I think correcting other people's viewpoints in a direct way is impolite".

#### **4. Dependence on teacher's involvement**

If online instructors are not actively involved in online discussion, some participants often felt anxious due to their strong dependence on teachers' comments. P4 was extremely concerned this issue. She stated,

"I knew the instructors would see what I post in online discussion. But they often did not give any feedback to me. So, under this situation, I always worried if my postings were appropriate to discussion topics. In face-to-face learning settings, I can really perceive their (teachers) involvement in course discussions. When it comes to online learning, their silent involvement (seeing the postings without giving feedback) often causes strong stress for me."

P3 related teachers' comments to her confidence. She said,

"My confidence built on their frequent comments. I knew they read my postings. However, as online courses progressed, their sparse comments would cause anxiety for me. I need their guidance all the time".

#### **5. Dilemma feeling on text-based communication**

Some participants considered that their English writing skills would not affect their participation in online discussions. They enjoyed text-based communication, but they did not like to write lengthy postings as their Western fellow students often did. P4 compared her face-to-face learning experiences with online learning. She said,

"At face-to-face courses, I wanted to be a active speaker like my American classmates. But English is not my mother language. During course discussions, I still need to spend much time thinking how to say in a correct way. So, compared to my American classmates, I looked like a non-active speaker. In the online world, I did not need to respond to my classmates or teachers instantly. I liked text-based discussion because I could have much time thinking how to say. However, I found that my online American classmates often wrote lengthy postings, which drives me crazy."

P3 attributed this issue to cultural background. She said:

"This (English) is their advantage. If I were American, I would easily write lengthy postings. But I am always wondering is it necessary to write this style of postings? I like asynchronous silent (word-based) communication but I think each posting should be succinct".

#### **6. Slang language in online discussion**

Native English students often wrote some slang few participants could not understand. P1 thought she had a good command of English skills. However, she hated to see slang language appearing in online postings. She said,

"Often, my classmates would put some slang in their postings. When I looked these terms related to American culture, I could not figure out what they mean".

P2 also experienced the same situation. He stated,

"I got used to this phenomenon. My classmates treated me as an American student. Their assumption is that I would know slang they posted. When I saw slang or terminologies I did not understand, I would google these special terms".

### **7. Gaining good impression**

Few participants tended to write more postings than the required to impress their instructors. P5 often cared about online instructors' views of her. She said, "In addition to weekly posting requirements, I would write more postings to impress my teachers. Although I could not see my teachers' face, I still wanted them know that I were active learners". P6 related good impression to good grade. She said, "The more postings I wrote, the higher grade I got. Even though I achieved weekly requirements, I thought the extra efforts I put would let me get good impression, which influences my teacher's grading judgment."

### **8. Heavy workload**

Before attending online courses, most participants felt that the online courses would be easy to pass. However, during the online learning process, they considered their previous expectations were unrealistic because they always had a lot discussion sessions and weekly assignments. They felt that workload in online discussion was overwhelming. They had to log in to the online learning management systems frequently to check discussion postings for each weekly instructional unit. Meanwhile, they must also pay closed attention to the interaction and exchanges of ideas in the discussion boards. P2 stated:

"Two weeks after taking an online course, I would like to drop the course. In a traditional face-to-face course, weekly one-hour or two hour course discussion was enough for me. But in an online course, you should check discussion postings all the time. It was a torture for me."

P4 also expressed the same feeling. She said:

"My face-to-face courses' instructors would not force me to engage in the class discussion. But, in online courses if I seldom expressed my personal opinions or commented on others' postings by leaving messages in the discussion boards, my instructors might notice my inactive engagement in the discussion activities simply by looking at the frequency counts of their names appearing in the discussion boards. So, I should behave to be an active speaker during the online discussions all the time, which I think workload was very heavy."

### **9. Need for new instructional strategy**

When asked if their instructors used any new strategies to facilitate online discussion, all participants mentioned that the instructors only asked them to post and reply messages in discussion boards. However, most participants could not tolerate to read through all the discussion postings. They hoped the course instructors could divide students into different subgroups so that they only have to review fewer discussion postings. Consequently, the exchange of ideas or generation of knowledge would become more effective and sufficient. P3 said, "During specific time, several postings popped up suddenly. Each new posting was followed by responded postings. It was mess." From a reading habit perspective, P5 stated,

"I hated to focus on computer screen a long time, especially for certain areas. Going through each posting was a torture for me. When looking for main ideas of discussion postings, you look like searching a needle in the ocean."

### **10. Factors influencing writing postings**

Participants expressed their concerns about posting discussion. Four factors often affect their willingness to write postings: course requirement, peer pressure, prior knowledge, and on-campus schedule. These factors were listed in Table 4.

**Table4**  
**Factors influencing writing postings**

Factors influencing writing postings	How many time each participant mentioned
1. Course requirement	6
2. Peer pressure	5
3. Prior knowledge	4
4. On-campus schedule	3

- (a) Course requirement: Since course requirement related to course grade, participants would not challenge the rules instructors set. All participants perceived that obeying course requirement was their responsibility. They took posting rules seriously. P1 said,

“If my instructor asked us to write three postings each week, I would do that. I did not want to fail the course. “

P3 agreed with what P1 said. She stated,

“I definitely will follow that requirement (posting). Although I would not write a lot of postings, I at least completed the required number of postings.”

- (b) Peer pressure: If online classmates actively engaged in online discussions, most participants perceived that peer pressure influenced their posting attitudes. From a competition viewpoint, P3 said,

“Online discussion board was a public area. Each student and the instructor could easily see how many postings you wrote. If they (classmates) wrote more (postings), I followed their pattern. I did not want to situate in disadvantageous point. “

P5 viewed this issue in a positive way. She stated,

“Sometimes there would be one or two active speakers in my online discussions. They may actively respond what you said, which causes you to spend more time on replying messages. Under such situation, the number of my posting would be growing. Although back-and-forth posting process was demanding, it was worth of sharing knowledge.”

- (c) Prior knowledge: Some participants emphasized discussion topics. Once the topics provoked their prior knowledge, they tended to write more postings. P2 took “Internet News” as an analogy. He said,

“It was just like browsing online newspapers. When the topics related to your past experience, you would be willing to spend much more time on them.”

P4 also said,

“If I know much more background information about the topics, I will be a active speaker. “

P5 added to what P4 said. She stated,

“Sometimes you would see several interesting topics listed in the discussion boards. I experienced these issues before and could provide my in-depth viewpoints. For example, I remembered one topic was online learning system. I used to be a system programmer. For that topic, I wrote at least ten postings.”

- (d) On-campus schedule: Because participants were on-campus students, on-campus resident schedules often dominated their time. Few participants considered a busy schedule might exhaust their thinking process, which leads to low productivity of postings. P4 said,

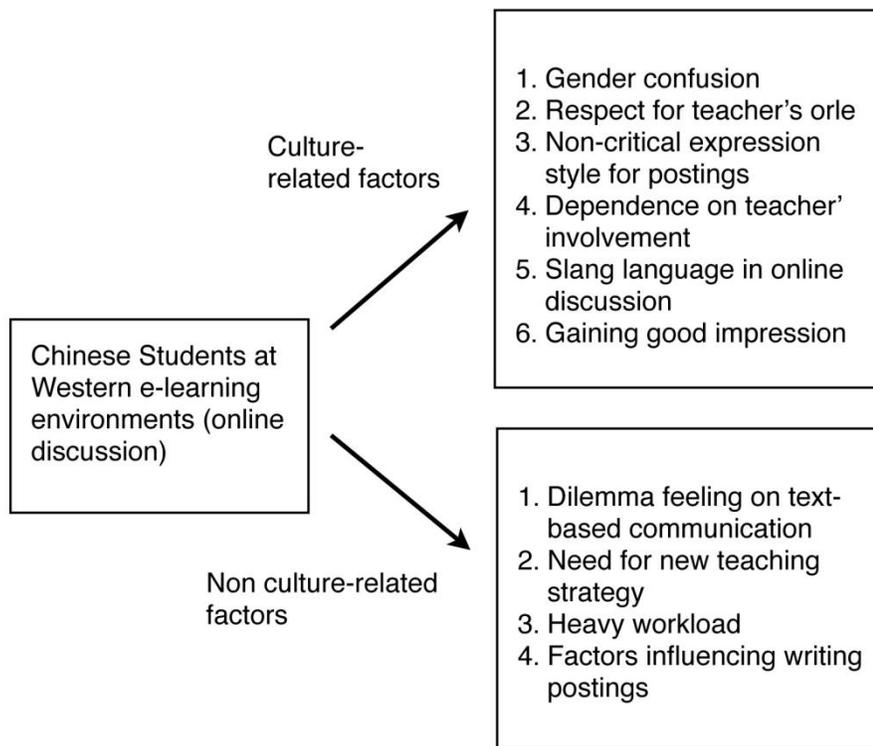
“You could not expect what will happen in a daily schedule. Sometimes unexpected things will put down your desire of engaging in online discussions”.

P1 stated,

“I only took one online course at each semester. When I fulfilled weekly posting requirements, I would shift my focus to my on-campus schedule. If I complete assignments at other courses (traditional face to-face courses), I will try to write more postings. After all, resident courses were my focus”

## Discussion

Through constant comparison between the results presented earlier and existing literature, six culture-related factors were found. Figure 1 summarizes the findings of this study.



**Figure 1 Findings of this study**

### ***Culture-related factors discussion***

As people from different cultural backgrounds engage in the same discussion issue, communication misunderstandings are inevitable (Hall & Hall, 1990). Apparently, in this study, as Chinese students engaged in cross-cultural online discussions, gender confusion, as one of misunderstandings, seemed to hinder peer communication development. Difficulty in identifying classmate’s gender embarrassed participants during learning process. This finding was consistent with Basharina (2008)’s study, which reported gender confusion existed in international computer mediated communication.

In addition to gender confusion, the use of slang language from American culture can also be regarded as one of communication misunderstandings. Although Chinese students in this study can look up the meaning of slang language by searching in the Internet, they were still confused what slang means when seeing slang terms at first time. This result was similar to Tu(2001)'s findings. In Tu's study, American acronym used by American students complicated Chinese students' cognitive understandings about discussion postings.

The Chinese educational system builds on Confucian-based philosophy (Lewis, 2003). In education settings, Chinese students should accept a teacher-based pedagogy and show great respect to instructors' wisdom (Chan, 1991). In this study, due to strong influence by Chinese culture, Chinese participants also showed such behavioral patterns in online discussions. Even though disagreeing with what instructors said, they still did not challenge the teacher's role, who was an authoritative figure in their minds (Tu, 2001).

Generally speaking, in traditional educational environments, Chinese learners' communication styles tend to be indirect. Often they avoid counterargument and confrontation during group discussions (Chan, 1991; Lewis, 2003). This concept is also applicable to online settings. In order to create a harmonious environment, Chinese students in this study used a soft and non-critical tone to compose their postings. Indirectness expression was their preference. This result supported Yang et al. (2008)'s findings, which showed that Asian-based groups of students tended to exhibit a non-straightforward and conservation fashion in online discussions.

Based on Hofstede (1991)'s worldview category, Chinese culture is large power distance and strong uncertainty avoidance. In schools, Chinese students are comfortable in a structured learning environment, where teachers are expected to control all learning resources. Under this situation, Chinese learners become used to rely on teachers' involvement (Williams-Green, Holmes, & Sherman, 1998; Morse, 2003). In this study, Chinese participants' online behaviors also exemplify Hofstede's theoretical concepts. Due to lack of face-to-face communication, Chinese students perceived anxiety appeared when teachers showed less involvement in the online discussions.

In Western educational settings (online or face-to-face), Chinese students' learning motivation is often higher than average students, and Chinese students work hard on school assignments (Nield, 2004; Zhao & McDougall, 2008). In this study, a few Chinese participants also performed harder on their weekly online learning. They attempted to write more postings than required to make a good impression on their online instructors. One participant even perceived her online behaviors might influence the instructor's grading judgment.

### ***Non Culture-related factors discussion***

Being international students, Chinese learners often encounter language barriers during the learning process in Western educational settings (Tu, 2001). In online learning environments, Chinese students also face the same issues (Tu, 2001; Ku & Lohr, 2003; Zhao & McDougall, 2008). However, because of different sampling techniques in this study, some Chinese students perceived that their English writing skills would not influence their performances in online discussions, where oral communication was not an emphasis. Although Chinese students enjoyed text-based communication, a dilemma feeling may erupt as they were forced to view American classmates' lengthy postings.

Moore and Kearsley (2005) indicated that one of myths in schools' distance learning is that many learners consider online courses are easy-pass zones and often misunderstand the features of online courses, which strongly emphasize self-directed learning. In this study, most participants' perceptions seemed to fit in Moore and Kearsley's statement. Their easy-pass expectations were shattered because heavy workload overwhelmed their weekly online schedules. Compared to traditional face-to-face learning, Chinese students should spend much time interacting with classmates by viewing and replying to messages in online discussions. This result supports Ku

and Lohr (2003) and Zhao and McDougall's (2008) findings. In their studies, online Chinese learners perceived discussion participation dominated large amount of time.

Past studies had reported that a relationship exists between instructional strategies and meaningful online discussions. Innovative strategies often promote in-depth discussions (Chou, 2009). However, in this study, all Chinese students did not recall any innovative instructional strategies from their online discussion experiences. Although intolerance with the old-fashion strategy (back-and-forth posting) did not influence discussion performance, Chinese students still demanded a new strategy. Rather than a whole class discussion, they considered a division of team discussion would be beneficial to knowledge exchange.

In this study, four main factors influenced Chinese students' willingness to write postings: course requirement, peer pressure, prior knowledge, and on-campus schedule. First, since online instructors established course requirements in online discussions, all Chinese students would obey posting rules. They at least completed the basic number of postings. However, whether or not sticking with rules is one of learning traits influenced by Chinese culture is worth further exploration. Second, Chinese students perceived peers' active engagement in online discussions strongly affects their posting attitudes. Chinese students may follow classmates' learning patterns from the aspect of competition and knowledge sharing. This result confirmed peers' behaviors play an important role of promoting active online discussions (Fung, 2004). Third, topics, which can provoke Chinese students' prior knowledge, contributed to the number of postings. Once topic contents were interesting to participants and related to participants' past experiences, Chinese learners would become active speakers in online discussions. Despite different Western learning environments, this result is consistent with Zhao and McDougall's (2008) study, which found that familiarity with topic related to Chinese students' posting willingness. Last, few Chinese students struggled with on-campus resident schedules. They considered a busy schedule might reduce the desire of writing postings. However, once those students' schedules are not full, whether or not their postings will significantly increase needs in-depth exploration.

## Conclusions

Despite the limitations of small sample size and generalizability, this study added support to existing literature that confirmed the effect of culture on non-native English speakers (Chinese students) in Western (American) e-learning environments (Tu, 2001; Ku & Lohr, 2003). Chinese learners indeed brought several learning traits influenced by Chinese culture to new learning settings. These unique learning characteristics urged students to engage online discussions in which several challenges affected learners' learning development.

Based on these findings and the discussion described earlier, two approaches for future research are suggested. First, although Chinese students exhibited learning traits in online discussions, little was known about instructors' viewpoints on this issue. Instead of looking into students' perceptions, future studies may examine online instructors' attitudes towards the minority group. The second approach is to identify factors influencing posting writing. Due to limited sample size, diverse opinions could not be obtained. Future studies may survey Chinese students through large sample size. A factor model of posting writing may be created.

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## Appendix

### Semi-structured Interview Guide

1. Does your English ability (writing skill) affect your online discussion? How so?
2. How often do you post in your online course? What factors make you write more posts, and what factors make you write fewer posts?
3. Do you like to respond to others' postings or to write new postings? Why?
4. How do you perceive the instructor's role in your online discussion?
5. How do you perceive the amount of work in online discussion?
6. What do you do when you disagree with the opinions of another student in the online discussion?
7. Did instructors use any new teaching strategies to promote online discussion? How did they implement the teaching strategies?
8. How do you perceive the feedback that peers and instructors give?
9. Compared to face-to-face learning, how do you perceive interaction in online discussions?
10. What is your expectation in the online discussion? Did any unexpected things happen during online discussion?

**Editor's Note:** Sharing of experience is sometimes tenuous. This distance learning system as established and discussed is to be congratulated. Hopefully it will be possible to expand the productivity of the system by research into other similar systems such as the Stanford University Distance Learning system and the systems in operation within California State University.

## **Interactive Video Conference Technology: Benefits and Challenges arising from its use in a Caribbean Island State University College.**

**Mark A. Minott  
Cayman Islands**

### **Abstract**

The aim of this evaluative study was to determine the benefits and challenges of employing interactive video conference technology (IVCT) at the local state University College of the Cayman Islands (UCCI) thus suggesting ways of improving its use as a teaching and learning tool at the local university college. Participants' responses were triangulated to gain an overall view of the benefits and challenges of employing IVCT. Interviews and questionnaire responses suggest that students and the institution benefited. Students had access to various courses without the added cost of travel and being away from jobs and family. While it was assumed that the institution experienced financial savings, this needs to be periodically scrutinized to ensure a balance between perceived savings and significant new expenditure. Challenges experienced include the fact that IVCT made additional demands on staff members. They had to change their modus operandi, manage the equipment and be sensitive to the camera and the students at the remote site while delivering a lesson. This study, however, brings into sharp focus the challenge faced by staff and institutions in dealing with 'immature' students, and the additional challenge of doing so at a distance.

**Keywords:** Technology, Higher Education, Cayman Islands, Students, Staff, Remote Site, Distance Learning.

### **Introduction and outline**

While the literature on Interactive Video Conferencing Technology (IVCT) highlights its effectiveness in higher education all over the world, there are no known writings which examine the benefits and challenges of utilising this technology at the local state University College of the Cayman Islands (UCCI). There is also no known written evaluation of its use locally since its installation and implementation in 2008. Therefore, to fill this literary gap and to evaluate the use of this technology, a study was launched. The aim was to ascertain staff and students' perception of the benefits and challenges of utilizing interactive video conferencing technology IVCT at the UCCI, thus suggesting ways of improving its use as a teaching and learning tool at the local university college. By triangulating staff interview and students' questionnaires data, an overall understanding of what constitutes benefits and challenges was constructed. Potential solutions to the challenges are provided.

This paper commences with a survey of literature which highlights potential benefits and challenges to the use of IVCT in higher education and establishes a framework for the study. This is followed by an outline of the research process, discussion of the findings, conclusion, and avenue for future work.

## Literature Survey

Interactive video conferencing technology, IVCT, is aptly defined by Bello, Knowlton & Chaffin (2007) as live two-way audio and full motion, two-way video communication between sites in different physical locations. Institutions, students, and staff benefit from and are challenged by the use of this technology. These benefits and challenges are documented in the literature presented.

### ***Benefits and challenges of IVCT for Institutions***

Featured quite prominently in the literature is the idea of cost in relation to institutional use of IVCT. Freeman (1998), points out that IVCT reduces the overall cost to universities and colleges running multiple sites by reducing the need for teaching and administrative duplications. Specifically, Canning (1999) points out, it reduces or eliminates travel time for staff between sites and compensates for the loss of face-to-face contact. The latter part of Canning's statement is a bit worrisome, for it can be argued that having the lecturer physically present in the classroom is always desirable in regards to students' learning. This is a cause for concern as the use of IVCT decreases the chance of a lecturer identifying nonverbal, facial and bodily cues which indicate that students do not understand what is being taught. Again, ambiguities can be effectively resolved in face-to-face conversations by providing immediate feedback. While this may be possible with IVCT, the technology can intimidate students and prevent them from asking for clarification on difficult issues, as will be highlighted later from the study's findings. Further, it is not possible to replace actual face-to-face meeting as an important medium for facilitating life-long bonds which is one of the indirect benefits of higher education.

Field (1995) suggests that another way institutions could gain financially is to hire out the IVCT to external users, thus making it possible for others to access the equipment and the attending benefits.

While cost saving seems to be an obvious benefit to institutions employing distance education technology, which includes IVCT, Forster and Washington (2000) see as a misconception the idea that distance education programmes which make use of various technologies is less expensive than traditional programmes. The writers suggest caution. Savings in one area, for example, faculty travel to the remote site, must be balanced against significant new expenditure on logistical support which are required for basic programme operation. In other words, the overall cost of utilising IVCT and other technologies may increase when installation, maintenance and renting of remote sites are required (Canning, 1999).

The main benefit of IVCT, however, is that it allows institutions to offer courses to smaller or isolated campuses (Canning, 1999). This effort, however, can be frustrated by technical problems in initial set up and ongoing operational errors. For example, video images run slower with numerous technologies in use, system breakdown, time for set up and shut down of the system 'eating' into time allotted to cover teaching material and a sense that doing things in a class which utilises technology, including IVCT, simply takes longer (Freeman, 1998, Kinnear, McWilliams and Caul, 2002, & Field 1995). Solutions to these challenges are not easily discerned but require further research, and must be examined in light of existing situations and circumstances unique to individual institutions. There are, however, a number of actions to take and instruments to utilise which could facilitate smooth flowing and effectively delivered lessons via IVCT. These are outlined in Table 1, along with rationale and suggestions for implementation.

**Table 1**  
**Facilitating lesson delivery via IVCT**

Actions	Rationale and Suggestions
Limit the size of the group at the remote site.	IVCT is ideally for small groups of geographically dispersed students (Canning, 1999).
Use a microphone with a homing beacon	A microphone with a homing beacon worn by instructors and that is detected by a video camera in the room allows for the 'tracking' of the instructor visually and auditorily. This is important because remote students need to see and hear the linked classroom and the instructor also needs to see the remote audience clearly.
Tie the microphone into the video system	Tying microphones to the video camera targeting system facilitate interaction with minimum disruption.
Room design	Design rooms to help students to enter and leave without crossing in front of the camera (Deadman, Hall, Bain, Elliot and Dudycha 2000).
Placement of Video Cameras	Place video cameras away from the line of sight of the students in the classroom - preferably suspended from the ceiling or affixed to the walls of the room.
Limit staff movement	Placing a camera and microphone at a control station limits the lecturer's roaming to the camera's field of view and audible range for the microphone (Deadman, Hall, Bain, Elliot and Dudycha 2000).
Staff Training	Training of staff should not be limited to the operations of the instruments but include how to prepare quality learning material, proper planning of sessions, ways to improve presentation/teaching skills, voice technique and how to foster interaction between presenter and audience (Field, 1995).

### ***Benefits and challenges of IVCT for Students***

One benefit of IVCT to students (already mentioned in the foregoing discussion) is that it provides learning opportunities to non-traditional groups, including those in geographically remote areas or those unable to gain access to learning due to time and location rigidities inherent within traditional tertiary education courses or family commitments (Canning, 1999). Students do learn via IVCT, for it facilitates interaction (Crawford, Sharpe, Gopinathan, Ngoh & Wong, 2002). Lea (2001) points out that interaction aids students' learning because they draw from the learning of their peers when constructing their own knowledge. Freeman (1998) also encourages lecturers to build into their lectures more opportunity for students to ask and answer questions. There is also a social dimension to communication via IVCT. Freeman (1998) states that simple interactions, like seeing and waving to their cross campus colleagues during lectures, were seen by students as valuable. Also, organised competitions between campus groups during the lecture fostered interest and concentration and a sense of cross-campus interaction (Canning 1999).

The use of IVCT also facilitates equity in learning because no student group is advantaged because it has the ‘better lecturer’ or the lecturer who is running the subject and writing the exam (Freeman, 1998). Equally important is the fact that IVCT increases student motivation and better instructor-student and student-student communication about key concepts and skills (Bello, Knowlton & Chaffin, 2007)

Freeman (1998) and Field (1995) also identified a number of challenges in the use of IVCT as it pertains to students. This includes the fact that students at the remote site may treat lectures like a television session; they may be more likely to chat and walk in and out of the lecture, and these disruptive behaviours can affect students’ concentration and learning. This is exacerbated when lecturers are unable to control the remote group and are unable to identify disruptive students at the remote site.

Another challenge to students, especially at the remote site, is the reduction of personal and physical access to lecturers. For instance after a class, they are also unable to discuss important issues privately with lecturers. Some students also avoid making a valuable contribution because of the IVCT, and sometimes projecting their images makes them feel self-conscious. In addition, students at remote sites find it difficult to initiate interaction because they are not as easily seen or heard. A solution offered to these challenges is to alternate live lecturers between main and remote campuses which has negative cost implications and /or there may be the need for a chairman or coordinator at the remote site during each class acting as a teacher assistant.

### ***Benefits and challenges of IVCT for Staff***

Benefits of IVCT to staff involve the fact that it reduces the inconvenience of being away from their resources and they also gain incentives to be better prepared to meet students’ learning needs, which involve thinking about the needs of students at the remote site (Freeman 1998). IVCT also encourages staff to be more meta cognitively cognizant of the teaching and learning process (Bello, Knowlton & Chaffin, 2007), and lectures and presentations can be made without being physically present at the remote location (Field 1995)

Staff, however, found some aspect of IVCT challenging. For example, Canning (1999) points out a massive increase in stress or pressure caused by the issues related to working/teaching. Specifically, these issues include: a greater need to prepare materials and plan for effectively using them, a greater reliance on other people to make a lecture work, restriction on lecturing style, being restricted to a particular spot in the lecture hall, technical problems, difficulty in gauging how a presentation is being received, and in establishing some kind of rapport with those on the receiving end (Field 1995 and Freeman 1998).

As indicated in the preceding discussion, this literature survey points to the potential benefits and challenges of the use of IVCT in higher education all over the world; however, there are no known writings about the benefits and challenges of using this technology in the local context, that is, the University College of the Cayman Islands (UCCI). Additionally, there is no known formal written evaluation of the use of this technology at the college since it was installed and implemented in 2008. Therefore, to fill this literary gap and to evaluate its use locally, a study was carried out between September and October 2009.

### **Research background and methodology**

The University College of the Cayman Islands is the state institution which provides a range of undergraduate and postgraduate programmes. Currently, there are approximately 1300 students enrolled in the University College (this number includes students on the main campus and the remote site, Cayman Brac or the ‘Brac’). Since 2008 the University College has used IVCT to enable students on the neighbouring island of Cayman Brac to access courses. This occurrence

fulfils a part of the University College mission statement, which is to be responsive to the needs of the local community.

Lecturers at the main campus who taught via IVCT, the IT coordinator, and the remote campus director (n=18) were interviewed via the college intranet email system. The response rate to the email interview was 77%. Students (n=30) at the remote site whose classes are facilitated by IVCT were asked to voluntarily complete an online questionnaire; the response to the questionnaire was close to 50%. To begin the data collection process, the surveys were developed and placed on a questionnaire web hosting site. The remote campus administrator and director were contacted and asked to direct students to the website. The hosting site webmaster developed a data collection system that funneled response data received from the respondents to a spreadsheet that could be manipulated during the data analysis process. All information received from the surveys was held confidential. Generally, the questionnaires were completed fully and accurately. Both staff and students were asked the following questions:

- What do you consider to be the benefits of using IVCT at UCCI?
- What do you consider to be the challenges of using ICVT at UCCI?

The following question was added to the student online questionnaire: Is there anything else you would like to say about IVCT at UCCI?

From the qualitative data provided, the researcher identified comments that had been repeated not only by an individual respondent, but by multiple respondents. The more words, phrases, or concepts had been repeated, the greater importance they were presumed to play. These words, phrases and concepts were categorised into themes (Powell and Renner 2003). Categorical aggregation was also used, where a collection of instances was sought with the hope that issue-relevant meanings would emerge (Creswell, 1998). By triangulating the results of staff interviews and students online questionnaires, an overall understanding of what constitutes benefits and challenges to the use of IVCT at the local university college was constructed. The results are presented in the following sections.

## Results

### **Staff comments**

Staff felt that there were benefits to students, the institution and themselves. For example, one member said, “Students on the Brac now have access to college courses for the first time without having to relocate...” Staff opinion differed on this point only in regards to terminology when qualifying the statement. For example, some spoke of IVCT giving students on the Brac access to ‘classes’, ‘education’, ‘course offerings’, ‘college education’ and ‘tertiary level education’.

Another perceived benefit was savings for students who would normally have to travel by aeroplane to the main campus. The institution also saves, for there was no need to employ additional faculty for the remote site. While several members of staff focussed on benefits to students and institution, two pointed out that IVCT also benefited staff, for it forced those who would otherwise not engage with IVCT and other technology to do so, and this “helps the educator to be on the cutting edge of distance education”.

Identified challenges were categorized under the following headings: technical difficulties, maintenance and other costs, teaching and learning dynamics, additional demands on staff and students, class size, and disturbances. Challenges identified were prefaced with phrases such as, “It is a pain in the neck”, “I don’t think it will ever work well”, and “I cannot think of one practical benefit for students...” All staff respondents (n=14) identified the fact that the equipment will malfunction. This is aptly stated by one member: “As is always the case with equipment, there is always a chance the equipment will fail and this may act as a deterrent to

student enrolment at the remote site”. Another staff member pointed out that the unpredictability of the IVCT equipment can cause frustration, especially for those in the Brac.

Others identified the frequency of malfunctions with such phrases as, “It does not always work and this semester in particular”, “it frequently does not work”, “Last year for example, we had the issue with sound”. Also identified was the nature of these malfunctions, for example, “the sound not working”, “inability to see students on the remote site and to present a power point show simultaneously”, and “phone line down and technical glitches”. Staff also acknowledged that malfunctions impact students’ learning. One member said, “Whenever the system malfunctions, the students suffer because I need to go find help, which might not be readily available”. Another, making reference to the failure of equipment, pointed out that, “When it does happen, valuable [teaching] time is lost and may never be regained”. The IT coordinator pointed out:

Technical difficulties are 95% user error, but lecturers either ignore the error (thus ignoring the Cayman Brac students), or try to fix the error themselves, further compounding the problems. Very few lecturers seek out assistance or further training on the technology without it being forced upon them

Only one member highlighted as challenges, the high cost of the equipment, maintaining the system, and the financial and time constraints which prevent more frequent visits of staff to the remote site. Also highlighted is the fact that it can be a challenge for a lecturer to travel to the remote site for a ‘live session’ thus transforming the main campus into the remote site. One respondent stated:

Sometimes [visits to the Brac by staff] can cause more difficulty for students and lecturers. This happens when you have a huge group of students left back on the main campus, many of who are immature themselves, and the lecturer is in the Brac for the class, sometimes teaching one, two or three students.

The demands that IVCT made on staff were many. These include trying to “keep students in two different locations interested and learning” and “Splitting attention between the Brac and the local class”. A member of staff elaborates on this point when she states:

It is impossible to make eye contact with the students in the Brac. If I want to feel like I am looking at them, I must look at the camera, but I am not seeing them at the same time. [By doing so however] I try to make the students feel like they are a part of the class but it can be difficult sometimes.

Another staff member noted other demands:

Performing for the camera-being always conscious of positioning oneself so that the ‘Brackers’ can feel that they are in the loop and are being spoken with or to. Limited spontaneity - one has to plan and scan or fax off way before the class, if the students are to get the material on time. So a brainwave, fifteen minutes before the class might not work as they [students on the Brac] might be disadvantaged if the material cannot get to them pronto.

Further challenges are noted as “Not being able to interface with students for any feedback, as well as with the staff at the remote location”, and the fact that “communicating with the remote site depends on the use of other technologies such as fax, email, and the computer, and this required ‘a change in gear’ for some staff”.

The maturity level of students presented yet another challenge to staff. Students just out of high school were seen as lacking the maturity to engage fully with IVCT, especially when taking foundational subjects such as English, Mathematics, Science and Spanish classes, which require a degree of individual assistance. Demands on staff also include taking on the role of managing the

equipment, which is “extra work and require extra classroom management skills, extra time, and attention”. One staff member expands on this idea by stating:

Staff at the main campus needs to find extra time to plan and get material to the Brac ahead of class time and this also means advance planning, sometimes days ahead of the class (the ideal situation at all times, but realistically, very challenging for many lecturers)

Staff reports that IVCT seems to restrain or, it appears, to intimidate (in some way) students on the main campus hindering them from being themselves. There is also the fear that “distance students may not receive the same attention as the local students, possibly creating a fairness issue both for the class discussions and also for testing”.

Class size was also another concern. Statements such as “bigger classes also means more noise” seem to characterise staff responses. One member said, “I find it easier to work with both campuses when the group before me is small - not more than twenty, for example”. This is of particular importance when having to deal with “immature students on the remote site, who frequently miss classes or hide by sitting under the camera so as not to be seen by the lecturer, or who arrive late for classes”. Finally, one staff member highlighted disturbance such as infrastructural failures at the remote, for instance the noise of the air conditioning unit malfunctioning and being amplified by the microphone system or the accidental ringing of mobile phones also amplified by the microphone system, and having to stop classes to remedy these situations.

### **Students' Comments**

Students' comments on the benefits of IVCT focused on savings for the institution and benefits to themselves. The institution saves on airplane fare for lecturers, and lecturers do not have to duplicate lessons, thus also saving time. The small number of students at the Brac site justifies the use of IVCT. It makes obsolete both the need for additional tutors to be employed to teach such few students and students having to travel to Grand Cayman. Another identified benefit is the interaction between students on the main campus and the Brac site and especially between those who held differing cultural points of view and ideas. One student said that the use of IVCT encourages “better debates and classes feel more like a real college”.

Challenges identified by the students focussed on the technical and teaching/ learning dynamics. Technical challenges identified include “electrical outages or disruptions in internet connection”, unclear video transmission and inappropriate lighting in the room at the main campus, which makes viewing the white board there difficult, and “set up and maintenance costs”. At times, the sound quality becomes distorted, thus affecting their ability to concentrate during lessons. Challenges in the teaching/ learning dynamics involve not being able to turn in work at the same time with students on the main campus. Students point out: “Class notes must be emailed to you and you cannot receive immediate response”. Also, there was a relational challenge, as one student points out, “You do not develop a one-on-one relationship with your fellow students or teacher”. Asking questions during sessions were difficult for some students. One said, “It feels like you're interrupting the class [at the main campus], if you have a question”. Another said, “sometimes it is uncomfortable because when you participate it seems amplified”, still another said, “the discussion part of the class is the challenging part because I don't know when to talk. It feels like I am watching the class rather than part of a class”. Despite these challenges, students thought that the use of IVCT should continue, and there was the need to offer additional classes via this method. Some thought IVCT is workable, but just needs to improve or keep up with technological changes. Others expressed a genuine appreciation that they are able to have classes at the remote site.

## Discussion

### ***Benefits of IVCT at UCCI***

The obvious benefits of IVCT identified by students and staff were course accessibility for students on the remote site and financial savings for the institution. While these findings are not surprising, they lend support to the established literature on IVCT, from a country not yet explored by other researchers, namely, the Cayman Islands. Also, while financial savings is a benefit, there is the need to periodically scrutinize expenditure on logistical support, maintenance and soft and hardware upgrades. Saving in aeroplane fares and accommodation for lecturers to visit the remote site must be balanced against significant new expenditure (Forster & Washington, 2000). This is important in the present economic climate, where there is a focus on being thrifty.

The study also brings into sharp focus (as a benefit) the fact that IVCT at UCCI forced lecturers who are normally anxious about technology to engage with cutting edge technology. One way of reducing staff anxiety in this area is to provide training in the operation of the IVCT. However, training of staff should not be limited to the operations of the instruments, but include how to prepare quality learning material, proper planning of sessions, ways to improve presentation/teaching skills, voice technique, and how to foster interaction between presenter and audience (Canning 1999 & Field, 1995).

### ***Challenges of IVCT at UCCI***

Technical difficulties and malfunctioning of equipment were major sources of irritation to both staff and students. While there seems to be a general agreement that power outages, periodic disruption in internet connection, and issues with sound and video are inevitable, the frequency of these occurrences is of grave concern. What is required is greater vigilance and availability of technical staff, especially during the times when the IVCT is in use. Another solution would be to provide specific training to staff in how to 'troubleshoot'. This idea is supported by staff, one of whom wrote: "There is a need for specific training of instructors who use the system, not just the brief sessions in how to use the equipment..." This would reduce the demand on the technical team, especially when classes are held outside of regular working hours. However, additional training may be viewed by staff as extra work (considering all they are required to do in a given day), therefore, extra training should be provided only on request by staff members. Another option is to use the first class or portions of each course using IVCT for the training of both lecturers and students in the workings of video conferencing - where to sit, how to interact, how to get the students or lecturers' attention.

The impact of IVCT on the teaching and learning dynamics was another area of challenge for both staff and students. For students, the main challenge was the lack of physical interaction between themselves and the lecturer and their inability to build one-to-one relationship with fellow students and lecturers. The literature in the foregoing discussion identified this as a challenge, especially for students at a remote site. A solution is to alternate live lecturers between main and remote campuses and arrange for students from the remote site to visit. However, this needs careful thought when being implemented especially when they may be immature students involved at the main site. In such situations, the solution may also include having a chairman or coordinator physically present and in the session at the remote site.

Also mentioned were the demands that IVCT made on staff with regards to the teaching/learning dynamics involved in trying to maintain students' interest at both sites and having to split their attention between both. The fact that IVCT limits staff spontaneity was highlighted as well. Further, communicating with students at the remote site depended on the use of other technologies such as fax, email, and the computer and these technology-related activities, coupled with the need to be well prepared and the inability to be spontaneous required a change in lecturers' thinking and behaviour. This required change was also a source of stress (Canning,

1999). These observations highlight the fact that technology does influence thoughts and behaviours (Hoffman, Patterson, Carrougher & Sharar 2001, and Robillard, Bouchard, Fournier, & Renaud, 2003). While these challenges may seem formidable, training and continued engagement with IVCT will improve the ability of the staff to cope. One should also consider the fact that the inability to maintain students' interest could be attributed to a number of factors, but the underutilization of appropriate teaching methods should not be over looked (Downing, 1997).

Another challenge reported by both staff and students was the fact that IVCT seems to restrain, or appears, to intimidate students in some way but especially those at the remote site. A student respondent clarified this by stating, "It feels like you're interrupting the class [at the main campus] if you have a question". Freeman (1998) encourages lecturers to build into their lecture more opportunities for students to ask and answer questions and Canning (1999) encouraged the use of organised competitions between campus groups during the lecture as this fostered interest and concentration and a sense of cross campus interaction.

The maturity level of students presented a unique challenge to staff, especially where students were viewed as having just left high school and lacking the maturity to engage fully with IVCT, particularly when taking courses such as English, Mathematics, Science, and Spanish which require a degree of individual assistance. Freeman (1998) and Field (1995) in their study help to clarify this point when they highlighted the kind of behaviour exhibited by students. For example, they may treat lectures like a television session. They may be more likely to chat and walk in and out of the lecture, and these disruptive behaviours affect students' concentration and learning. As indicated in the preceding discussion, this situation is exacerbated when lecturers are unable to control the remote group and are unable to identify disruptive students at the remote site.

Here, too, a solution may be having a chairman or coordinator physically present at the remote site and to arrange individual virtual face-to-face time for students needing assistance, via the IVCT. This however, will need to be built into staff teaching time and schedules and could be difficult to schedule when others need to use the equipment for other classes.

Table 2 provides a summary of the challenges and solutions of using IVCT at UCCI. This gives ease of reference to those who would use the data to influence policy and action. For it is by addressing these challenges that the fulfillment of the underlying reason for the study will be realised: an improvement in the use of IVCT as a teaching and learning tool at the University College of the Cayman Islands.

**Table 2**  
**Summary of Challenges and Solutions**

<b>Challenges</b>		<b>Solutions</b>
<b>Technical difficulties:</b>	Frequent power outages, periodic disruption in internet connection, distorted sound & video equipment.	Greater vigilance and availability of technical staff. Provide specific training to staff in how to 'troubleshoot'.
<b>Teaching &amp; Learning dynamics:</b>	<b>Students:</b> inability to physically interact with lecturers and to build one-to-one relationship with fellow students.	Alternate live lecturers between main and remote campuses and arrange visits to the main site for students from the remote site.
	<b>Students:</b> IVCT restrains or intimidates students	Provide more opportunity for students to ask and answer questions.
	<b>Staff:</b> maintaining students' interest at both sites. Limits spontaneity. The use of various communication instruments requires a change in thinking and behaviour.	Training and continued engagement with IVCT will improve the ability of staff to cope with these challenges.
	<b>Staff:</b> students lacking the maturity to engage fully with IVCT and needing special assistance with selected subjects.	Chairman or coordinator being physically present at the remote site. Arrange individual virtual face-to-face time for students needing assistance.

### Conclusion and Avenue for Future Work

The challenges brought on by the use of IVCT at UCCI are many and affects both staff and students. Additional demands are placed on staff members to change their modus operandi, manage the equipment, and to be sensitive to the camera and the students at the remote site. Students are mainly challenged by the technical aspects and the teaching and learning dynamics. In light of these and other challenges, it behooves institutions considering the use of this technology to carefully consider the problems and solutions identified in this and similar studies.

Also of significance is the fact that this study was carried out in the early years of the use of this technology at the local college. It would be of interest to the local University College to carry out this same process in a few years to ascertain whether the currently identified benefits and challenges remain or have changed. The degree to which staff have matured in their use of the tool, and students' continuous engagement with it are important factors when considering the effectiveness of IVCT as a teaching/learning tool. Also, future study could examine the impact (if any) of being physically located on the Brac and the degree to which studying 'at home' positively affects students' learning. This could be compared with students from the Brac who are studying on the main campus. Finally, the small sample size of this study suggests that the findings should not be generalized but the ability to generalize the findings was not the original intention of this study.

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**Editor's Note:** There are many experiments that compare traditional instruction with interactive multimedia and web-based learning. This is a study teaching symbolic logic for college level students in Turkey. It employs discovery learning, real-life situations, and interactive visuals to positively influence the performance and attitudes of teachers and learners in 9<sup>th</sup> grade mathematics.

## **The Evaluation of Introduction Level Computer-Assisted Symbolic Logic Materials Based on Realistic Mathematics Education and Guided Discovery Learning Approach**

**Jale BINTAS and Mehmet Fikret GELIBOLU**

Turkey

### **Abstract**

Logic is the formal systematic study of the principles of valid inference and correct reasoning (Cristal, 2002). In this research to teach mathematical logic we used the “Realistic Mathematics Education” (RME) approach that considers mathematics as a human activity, and the “Guided Discovery Learning” approach which enables students to construct knowledge by themselves. Also, computer assisted applications of the experiment draw students’ attention and provide individualized learning to students. The main purpose of this study is to determine the effect of developed computer assisted symbolic logic materials that are based on realistic mathematics education and guided discovery learning approaches. The research sample consists of 59 students chosen for the experimental and control groups from 9<sup>th</sup> grade high school students in Turkey. Selection was based on a quantitative sufficiency performance test that identified the general mathematical status of students. A pre-test post-test control group experimental design was used in the research. Quantitative methods were used to analyze the effect of experimental instruction on the pupils’ and teachers’ opinions. To measure and compare the achievement of students at the end of the experimental instruction process, we developed a 30 item post test to measure performance in logic in the 9<sup>th</sup> grade mathematics curriculum. Post-test scores were significantly different in favor of the experimental group. At the end of the research, data was gathered on students’ and teachers’ points of view. Results showed that using computer assisted instructional materials based on Realistic Mathematics Education and Guided Discovery Learning are more efficient than traditional education.

**Keywords:** logic education, realistic mathematics education, guided discovery learning, computer assisted instruction, worksheets

### **Introduction**

In the technological world we live in, the value of knowledge is more and more significant. Strong societies are only possible if individuals keep up with the increasing educational needs. That is why it is a deep concern of all educational units to train creative, productive people, who can solve problems, analyze, synthesize, use technology effectively and know how to find knowledge. A major way to make people qualified is related to logic education.

Logic is the formal systematic study of the principles of valid inference and correct reasoning (Cristal, 2002). “The increasingly technical demands placed on people by the information revolution makes it all the more important that people understand basic logical principles of reasoning” (ASL Committee on Logic Education, 1995). On that point new approaches on education help us to meet the needs of a growing world. Logic has been taught learners in several disciplines. Logic was formerly a branch of philosophy; more recently it became an essential part of mathematics and computer sciences. We believe that people who understand mathematics and use logic, have more choices to give form to their future than those who don’t.

“Mathematics education provides needed knowledge and equipments which help individuals to understand physical world and social interaction. It helps to guess, analyze their experiences, and gets them to have a systematic approach and language to solve problems. It also facilitates creative thinking, and accelerates developing reasoning skills” (Bulut, 2005).

Researchers and educators are trying to explain how learning happens and they are developing many approaches, techniques, strategies, and methods to improve the education such as “Realistic Mathematics Education”, “Guided Discovery Learning” and “Computer Assisted Instruction”.

Realistic Mathematics Education (RME) is a teaching and learning theory in mathematics education that was first introduced and developed by the Freudenthal Institute in the Netherlands. This theory has been adopted by a large number of countries worldwide. Its important points are that mathematics must be connected to reality as human activity. Mathematics must be close to children and be relevant to every day life situations (Zulkardi, 1999).

Discovery Learning is an inquiry-based, constructivist learning theory that takes place in problem solving situations where the learner draws on his or her own past experience and existing knowledge to discover facts and relationships and new truths to be learned. Students interact with the world by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments. As a result, students may be more likely to remember concepts and knowledge discovered on their own (Learning Theories Knowledgebase, 2008).

“Computer-assisted instruction” refers to instruction or remediation presented on a computer. This enhances teacher instruction in several ways. Computer programs are interactive and can illustrate a concept through attractive animation, sound, and demonstration. They allow students to progress at their own pace and work individually or problem solve in a group. Computers provide immediate feedback and differentiated lessons to capture the students’ attention, challenge students who are at different levels, and improve instruction for students with disabilities (The Access Center: Improving Outcomes for All Students K-8, 2008).

Although there is much computer software like Alfie, Aristotle, Plato, LogicCoach, Organon, and Tarski’s World for learning different types of logic, we strongly needed to design our own materials for a number of reasons, such as:

- Existing materials are too specific and do not cover the symbolic logic curriculum of Turkey in 9<sup>th</sup> grade entirely. (Generally they are not about propositional logic or just focus on making proofs.)
- Most materials are inappropriate for high school education level students.
- Language or symbols in some materials are not used in Turkey.
- Mostly, they are not user friendly.
- Some of them need to install to a specific operating system or hardware architecture.
- Some of them are not free of charge.

Thus, in this research we developed computer asisted symbolic logic instruction materials combining “Guided Discovery Learning”, and “Realistic Mathematics Education” approaches to compare with traditional education in an experiment.

## Research Goal

The main purpose of this study is to determine the effect of developed computer assisted symbolic logic materials that are based on realistic mathematics education and guided discovery learning approaches.

In this research, we investigated whether or not developed symbolic logic instruction materials make a difference compared to traditional logic education in 9th grade mathematics.

## **Method**

Quantitative analysis was used to determine the effect of experimental instruction on pupils' and teachers' opinions. A pre-test post-test control group experimental design was used in the research. The research was conducted in the fall semester of the 2007-2008 academic year.

### **Participants**

The research population was randomly chosen from three high schools in Izmir city of Turkey. A pre-test reliability study was made on 151 students; the post-test reliability study was made on 259 students. Students were assigned to experimental and control groups according to pre-test scores. The experimental sample consisted of 59 students. Both pre-test and post-test were delivered to both the traditional group and the experimental group.

### **Content**

Symbolic logic is being taught in Mathematics lessons in 9<sup>th</sup> grade in Turkey. And in the syllabus the following topics are being presented:

- Terms and axioms
- Premises, compound propositions
- Number of states of compound propositions
- Negation operator ( ' ), equivalence, double negative elimination
- Conjunction, disjunction, implication, and bi-conditional ( $\wedge \vee \Rightarrow \Leftrightarrow$ ) connectives
- Tautology and contradiction
- De Morgan's Theorems

The lesson content was presented to both control and experimental groups with different educational tools and approaches. While the control group received traditional education, the experimental group was trained with the developed materials under guidance of the teacher.

### **Application period**

Both traditional and experimental groups received 12 hours of instruction over a period of three weeks.

### **Limitations**

All the tests and tools were developed in the Turkish language. (It will be possible to add different language support in the future.)

### **Instructional materials and measurement tools**

For the experiment we developed pre-test, post-test, educational software, and worksheets. (For further details please visit: <http://site.mynet.com/fikretgelibolu/logic/help.html>)

### **Software**

We designed the computer assisted materials using a Shockwave Flash Technology and web interface to provide user flexibility and compatibility. Passwords controlled access to each topic in the web interface (Figure 1) so the teacher could guide the natural flow of lessons. Some topics have prerequisites so it is essential for students to receive them in a predetermined sequence.

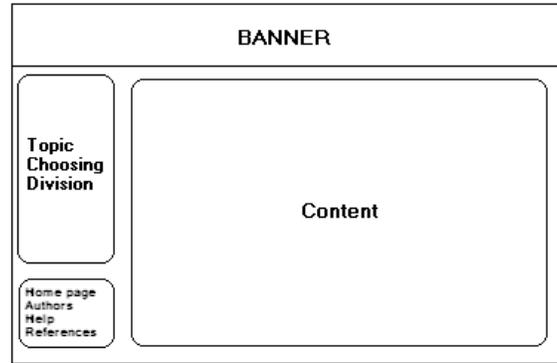


Figure 1. Web interface scheme

There are three kinds of instructor application when analyzed structurally:

- Drag/drop applications (Figure 2)

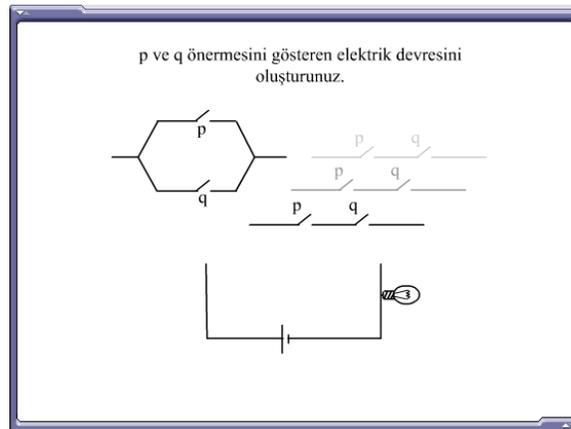


Figure 2. Dragging

Turn on/off applications (Figure 3)

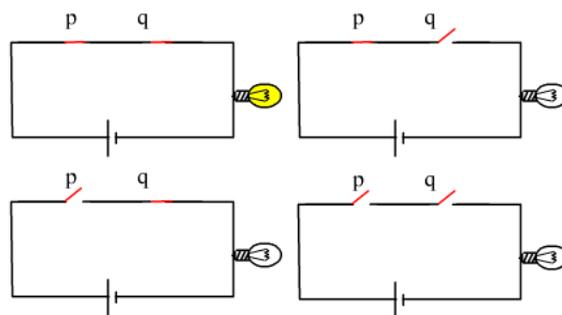


Figure 3. Electrical switches

- Interactive tables (Figure 4)

p	q	$p \wedge q$
1	1	1
1	0	0
0	1	0
0	0	0

Figure 4. Truth table

### Worksheets

In addition to computer assisted software, we also developed RME and Guided Discovery Learning approach based worksheets as instruction tool.

### Lesson example

First, students are told to follow the instructions in the computer assisted materials.

p, p', q, q' önermelerini sürükleyerek koşullu önerme cümlelerini test ediniz ve buna göre doğruluk tablosunu doldurunuz

p: zil çaldı (1)  
p': zil çalmadı (0)  
q: kapıyı açtım (1)  
q': kapıyı açmadım (0)

\_\_\_\_\_ ?  
öyleyse  
⇒ \_\_\_\_\_

p	q	$p \Rightarrow q$	$q \Rightarrow p$	$(p \Rightarrow q) \wedge (q \Rightarrow p)$
1	1	0	0	0
1	0	0	0	0
0	1	0	0	0
0	0	0	0	0

Figure 5. Application

In this material (Figure 5), students can drag and drop the premise sentences through the empty lines in order to make a conditional premise. Students check their premises: either the meaning of the becoming conditional sentence or the feedback of the software (Figure 6-7).

\_\_\_\_\_ **Doğru**  
öyleyse \_\_\_\_\_  
⇒ \_\_\_\_\_

zil çaldı (1)                      kapıyı açtım (1)

Figure 6. True premise

( If the bell rings then I open the door – True)

zil çaldı (1)
Yanlış
kapıyı açmadım (0)  
 \_\_\_\_\_  
 öyleyse  
 ⇒

**Figure 7. False premise**  
(If the bell rings, then I don't open the door – False)

Then they fill the truth tables below. The last part of the truth table remains inactive until students fill the first two premises right as seen in Figures 8 and 9.

p	q	$p \Rightarrow q$	$q \Rightarrow p$	$(p \Rightarrow q) \wedge (q \Rightarrow p)$
1	1	1	1	0
1	0	0	1	0
0	1	1	0	0
0	0	1	0	0

**Figure 8. Preconditioned truth tables**

p	q	$p \Rightarrow q$	$q \Rightarrow p$	$(p \Rightarrow q) \wedge (q \Rightarrow p)$
1	1	1	1	0
1	0	0	1	0
0	1	1	0	0
0	0	1	1	0

**Figure 9. Subsequent interaction**

After the students fill the entire table correctly the feedback appears like in Figure 10.

p	q	$p \Rightarrow q$	$q \Rightarrow p$	$(p \Rightarrow q) \wedge (q \Rightarrow p)$	T E B R İ K L E R
1	1	1	1	1	
1	0	0	1	0	
0	1	1	0	0	
0	0	1	1	1	

**Figure 10. Feedback – (Congratulations)**

After this application students are expected to fill the worksheet 10 as shown with blue italics.

**Worksheet 10**

p premise: The temperature of water is 100°C.

q premise: Water boils.

If the truth value of the premises given upside is 1 (true) then write down the premises and their truth values below.

$p'$  : *The temperature of water is not 100°C.*

$q'$  : *Water doesn't boil.*

$p \Rightarrow q$  : *If the water is 100°C, then water boils.*

$q \Rightarrow p$  : *If the water boils, then the temperature of water is 100°C.*

$(p \Rightarrow q) \wedge (q \Rightarrow p)$  : *If the water is 100°C, then water boils and if the water boils, then the temperature of water is 100°C.*

p	q	$p \Rightarrow q$	$q \Rightarrow p$	$(p \Rightarrow q) \wedge (q \Rightarrow p)$
1	1	<i>1</i>	<i>1</i>	<i>1</i>
1	0	<i>0</i>	<i>1</i>	<i>0</i>
0	1	<i>1</i>	<i>0</i>	<i>0</i>
0	0	<i>1</i>	<i>1</i>	<i>1</i>

“If and only if the temperature of water is 100°C then water boils” premise is shown as “ $p \Leftrightarrow q$ ”. So fill the table below considering the sense of the sentences.

p	q	$p \Leftrightarrow q$
1	1	<i>1</i>
1	0	<i>0</i>
0	1	<i>0</i>
0	0	<i>1</i>

What kind of relations are there between the premises ( $p \Leftrightarrow q$ ) and  $(p \Rightarrow q) \wedge (q \Rightarrow p)$ ?

As a result we expect that students discover the last columns of last two tables upside have the same values. Thus they are expected to write “the premises *“If the water is 100°C then water boils and if the water boils, then the temperature of water is 100°C”* and *“If and only if the temperature of water is 100°C then water boils”* have the same meaning, and write the equilibrium  $(p \Leftrightarrow q) \equiv (p \Rightarrow q) \wedge (q \Rightarrow p)$ .

As it can be seen in the instance materials, learners use real life examples in the materials. While teaching premises, logical connectives etc, students always use relations of real objects, events or what they perceive realistic as been referred in RME. Also through guided discovery learning

approach, expected results are not ever given directly in the materials; students always discover the answers by following steps on their own. These are especially the distinguishing ways of the materials we developed.

### Pre-test (quantitative sufficiency performance test)

In order to compare the introductory information of groups, we developed a 32 itemed pre performance test about general mathematical knowledge. Questions are chosen from previously applied governmental examinations to enter high schools or take scholarships in Turkey. Experts on mathematics education department eliminated inappropriate items considering content validity and 92 questions reduced to 32 items. These items are applied to 151 students from two different high schools. Test reliability was analyzed in Iteman v3.5 program and no more item needed to be excluded.

**Table 1**  
**Pre-test reliability analysis results**

N	S	Maximum	Median	Mean	Alpha
151	4.88	30	19	19.3	.77

### Post-test (logic issue performance test)

At the end of the experimental instruction process, to measure and compare the achievement of students, we developed a 30 itemed performance posttest about logic issue in the 9<sup>th</sup> grade math curriculum. Draft items are analyzed and rearranged considering validity and reliability as on the pre-test. And tested on 259 students from three high schools. Statistics are shown in table 2.

**Table 2**  
**Post-test reliability analysis results**

N	S	Maximum	Median	Mean	Alpha
259	8.06	29	18	16.93	.92

### Findings

This research was conducted to test the instruction with developed instructional materials, and compare it with traditional instruction. Two random class were chosen as experiment and control group for that purpose. Pre-test was applied to both groups and analyzed using independent samples t-test in SPSS. No significant difference on introductory mathematical knowledge of students between groups could be found as shown in table 3. Thus both groups were considered equal about quantitative sufficiency.

**Table 3**  
**Equivalence of groups**

Pre-test	N	$\bar{X}$	S	df	t	p
Experiment Group	29	21.51	3.46	57	1.28	.20
Control Group	30	20.26	4			

\*p>0.05

After the approximate 3 week instruction, post-test was applied to groups, and gathered data was statistically analyzed using independent samples t-test in SPSS.

**Table 4**  
**Final status of groups**

Post-test	N	$\bar{X}$	S	df	t	p
Experiment Group	29	25.55	2.22	51.56	2.38	.02
Control Group	30	23.83	3.23			

\*p<0.05

As can be seen in table 4, post-test scores were significantly differentiated in favour of experiment group.

#### ***Pupils' opinion on Realistic Mathematics Education approach and Guided Discovery Learning based computer assisted mathematical logic instruction***

A questionnaire with nine open-ended questions was used for this analysis. Twenty four (24) students from the experiment group participated in the questionnaire voluntarily. The majority of the pupils assessed their performance as positive. They enjoyed the topic on both content and application aspects. Almost all of the pupils found assistive materials in the lessons to be useful and believed they benefited from the assistive learning materials.

*“Computer assisted materials are useful. They draw our attention and make us learn better.”* (Student 16)

*“I believe that they're (worksheets) a good source (of learning) for better understanding.”* (Student 7)

*“Using the related materials make us visually perceive better.”* (Student 22)

When asked whether they would like to change something, students didn't recommend any modification in materials, but they did suggest the possibility of adding a smart board and mobile applications.

#### ***Teachers' opinion on Realistic Mathematics Education approach and Guided Discovery Learning based computer assisted mathematical logic instruction***

To learn teachers' opinions about the learning materials and logic education we used a questionnaire which includes 15 open-ended questions. 9 mathematics teachers from 4 different schools participated in the questionnaire after seeing the materials. Majority of the teachers find logic topic difficult, abstract, and essential, which teaches systematic and correct thinking.

*“I consider that it (logic) is essential because it teaches systematic and correct thinking.”* (Teacher 4)

*“I find it (logic) crucial because it orientates students to think abstract and improves their thinking.”* (Teacher 6)

Teachers stated that using computer assisted education and real life instances might be the most appropriate techniques for mathematical logic education.

*“I think materials such as visual contents which include real life examples should be used with computer assisted education.”* (Teacher 9)

Teachers found the developed computer assisted materials useful because they provided a permanent incentive and concrete learning experiences. They also mentioned that worksheets were useful for control and permanence of instruction.

*“These (learning) materials structured the way which draw students’ attention and motivate. So they (learning materials) will be useful.”* (Teacher 3)

*“Worksheets provide permanency (on learning) when students discover and find out by themselves”* (Teacher 3)

Teacher’s ideas about their lessons were usually parallel to the techniques used in the developed materials, thus they believe lessons should be assisted by such materials.

Almost all of the teachers had a positive attitude about using assistive learning materials and they stated that they were not willing to make any changes in their lessons.

## Conclusion

“Realistic Mathematics Education” and “Guided Discovery Learning” approaches based, computer assisted developed logic instruction materials’ efficacy was tested in this research. Following a three week experiment, student achievement in the posttest favored the experimental group which was instructed by developed materials. It was understood that teaching mathematics as a real life activity by using real life examples on abstract matters, and instructing the lessons using discovery techniques including interactive applications, influence students more positively than traditional education. Also students and teachers mentioned that they were quite interested in using developed logic instruction materials. Nonetheless, teachers resist making any change in their lessons because they cannot anticipate the effect on their own students, or they already use some good instructional materials with proven success.

Instruction of logic is essential because it facilitates critical thinking. Logic instruction contributes factors which develop scientific and consistent reasoning skills and the ability to evaluate events that happens around us. This research did not test the persistence of learning, but use of a discovery model may have a positive effect. Further studies are required to verify and extend the findings of this study.

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## Appendix

Developed materials and the instruction manual are available on  
<http://site.mynet.com/fikretgelibolu/logic/help.html>

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