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PUBLISHER'S DECLARATION

Research and innovation in teaching and learning are prime topics for the *Journal of Instructional Technology and Distance Learning* (ISSN 1550-6908). The Journal was initiated in January 2004 to facilitate communication and collaboration among researchers, innovators, practitioners, and administrators of education and training involving innovative technologies and/or distance learning.

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Editorial

The Future of IJITDL

(this Journal)

Donald G. Perrin

The editors are dedicated to continue publication of this refereed journal each and every month and to continue to provide this service free for authors and readers. The Journal depends on volunteer referees, editors, production and technical staff to create and maintain the web pages and the website. To coordinate these activities is increasingly complex because of availability and turnover of volunteers in the various stages of review, editing, and production. Also, technical problems with software and the internet have increased sharply in the past year. Security is also been a problem, and professional services have been required to keep computers working and recover from cyber-attacks on our systems.

For the long term, the Journal is seeking a home in academia where it can draw upon the resources of professors and students and information technology services for basic support. The editorial board is ready to seek donations but they are opposed to advertising in the Journal and they are opposed to sponsorship by organizations with invested interests in the fields we represent. As an interim measure, DonEl Learning, Inc which has supplied operating funds and labor for the past decade, is being reincorporated as DonEl Learning Foundation, a 501C-3 non-profit that will make donations tax deductible, at least within the United States.

The prospect of more funds has enlarged the vision to a journal that can contract for expertise where it is needed to speed up the peer review process, add copywriters and artists to the editing and publication staff, and employ technical support to upgrade and maintain both internal and external communication systems and web pages.

The first task is to expand the pool of editors and reviewers, upgrade the computer management system for acknowledging receipt and tracking documents, make tracking more transparent to authors, and to catch up the publication backlog. Beyond that, emphasis will move to raising quality and streamlining every stage of review, acceptance, editing, production, publication and web access and viewing.

To reduce production time, single articles are now available only as part of a monthly issue (as with traditional paper journals). In the process, we lost track of how many people access each article and for how long. This data is important to authors, and it is important for the editorial staff to seek and select articles consistent with reader interests.

The next phase will be to upgrade the technical quality of the web. This includes making the interface more friendly and responsive, and repair damaged or corrupted files and menus. You, the readers, can help by bringing any problems you have experienced in using the website to our attention, we will take care of it as soon as possible. For the moment, please direct these comments to submit@itdl.org.

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Editor's Note: This carefully controlled study explores the significance of asynchronous web-based discussions on EFL learners' critical thinking skills in a blended learning environment. It concurs with other research that demonstrates significant value of asynchronous discussions to develop critical thinking skills.

Asynchronous web-based discussion forums in a blended learning environment: boosting learners' critical thinking

Mona Khabiri and Mohammad Taghi Zarrinsadaf
Iran

This study investigated the effect of asynchronous web-based discussions in a blended learning environment on EFL learners' critical thinking. Sixty four intermediate EFL learners were selected and assigned randomly to an experimental and a control group after being homogenized through a piloted PET. Honey's critical thinking questionnaire was administered to all participants as pretest and posttest. Whereas the participants in the experimental group were asked to discuss topics in the asynchronous web-based discussion forum, the control group discussed the same topics in class. The results of the pretest-posttest control group design, analyzed by running ANCOVA, confirmed with a large effect size (i.e., .76) that participation in asynchronous web-based discussions had a significant effect on EFL learners' critical thinking.

Keywords: critical thinking, asynchronous web-based discussion forum, blended learning environment.

Introduction

The Internet is a powerful means of communication. Massive sociological analyses have documented that the Internet has qualitatively transformed everyday communication and information practices in commercial, financial, professional, educational, recreational, and interpersonal realms (e.g., Castells, 1996, 1997, 1998, 2004). The Internet has also become an indispensable resource for English language teachers and students.

Studies on the uses of Internet and local-area network communication technologies in second language learning and teaching emerged in the early 1990s. These studies (e.g., Cononelos & Oliva, 1993) suggested a number of pedagogical benefits for the use of Computer Mediated Communication (CMC), many of which were not readily available in conventional L2 language instruction, such as improved writing skills and general communication.

Luppicini (2007) gives a broad definition of CMC and describes it as "communications, mediated by interconnected computers, between individuals or groups separated in space and/or time" (p. 142). CMC is closely related to the concept of Computer Assisted Language Learning (CALL) and, according to Hubbard (2009), is perhaps the most researched area in the field of CALL. Beatty (2003) defines CALL as "any process in which a learner uses a computer and, as a result, improves his or her language" (p. 7). According to Kern (1995) and Warschauer (1996), early studies on CALL tended to focus on linguistic features and other characteristics of CMC in single classrooms. Subsequently, there was a focus on online language learning, use of Internet, and socio-cognitive aspects of CMC (Kern & Warschauer, 2000). Romiszowski and Mason (2004) assert that one of the main distinctions within CMC has been made between synchronous (real-time) and asynchronous (delayed time) communications. They maintain that both Synchronous CMC (SCMC) and Asynchronous CMC (ACMC) provide complex processes of interaction between participants.

Likewise, some documented reports on CMC (e.g., Kern, 1995) claimed a greater opportunity for expression of ideas and more time for reflection during the production of messages when compared to face-to-face interaction. Likewise, Thorne (2008) states that the ability to link

students through networked computers has created a variety of opportunities for language-based social interaction in L2 education.

As explained earlier, ACMC occurs in delayed-time and does not require the simultaneous participation of users (Thurlow, Lengel, & Tomic, 2004). Web-based discussion forums are an asynchronous communication tool involving a user (usually an instructor) posting a question or an assignment, and the learners posting their responses at a later time.

An asynchronous web-based discussion forum (also called a bulletin/message board, a conference room, or a threaded discussion forum) is considered more appropriate for reflection on meta-linguistic issues than a synchronous medium. The reason is claimed to be the extra time learners have to spend thinking about the messages they receive and messages they produce. Hence, they are involved in advanced cognitive processes for a longer time (Lamy & Goodfellow, 1999; Weasenforth, Biesenbach-Lucas, & Meloni, 2002).

Similarly, Gutsche (2009) asserts that because they are asynchronous, web-based discussion forums allow the learners more time to reflect on a topic or question before posting a message. ACMC is reportedly useful for "encouraging in-depth, more thoughtful discussion; communicating with temporally diverse students; holding ongoing discussions where archiving is required; and allowing all students to respond to a topic" (Branon & Essex, 2001, p. 36). In a study, Kol and Schcolnik (2008) showed that ACMC encouraged a unique type of thoughtful interchange. They found that it enabled learners to practice L2 communication without slipping into their native language, as can occur in EFL class discussions.

Despite all the benefits of computer assisted or computer mediated language learning, there are some problems attributed to the specific learning context of e-learning. E-learning is the learning that takes place in environments where instructional materials are transferred electronically through the Internet, course software, or with information and communication systems which serve as specific media to implement the learning process (Akkoyunlu & Soylu, 2008; Tavangarian, Leypold, Nölting, Röser, 2004).

According to Osguthorpe and Graham (2003), e-learning is able to present course content in a longer period of time compared to the classroom environment and other methods, and it ensures a learning environment which is independent of time and place. However, they further maintain that e-learning environments pose certain disadvantages such as a lack of sufficient recognition between the teacher and learner and limitations concerning the communication among learners. These disadvantages, according to Osguthorpe and Graham, have evoked a search for new environments which combine the advantages of e-learning and traditional learning environments. This new environment is known as "hybrid learning" or "blended learning". Brown (2003) states that blended learning "provides all the benefits of e-learning, including cost reductions, time efficiencies and convenience for the user, but it also provides that essential one-on-one, personal understanding and motivation that only a human instructor can provide" (p. 14).

Perhaps in today's information era, thinking skills are viewed as crucial for language learners to cope with a rapidly changing world, and critical thinking seems to be one of the most important thinking skills. Garside (1996) states that one of the earliest definitions of critical thinking is, "The predispositions and ability to systematically and logically examine the evidence that supports various conclusions, systematically and logically examine the reasoning that links evidence with conclusions, and produce statements and assertions that are supported by both sound evidence and reasoning" (p. 214). This broad definition is very close to Glaser's definition of critical thinking (as cited in Garside, 1996). Garside (1996) further states that the contemporary definitions of critical thinking are just extensions of this early version.

To capture the essence of contemporary definitions, one can refer to Ennis (1992) who defines critical thinking as "reasonable, reflective thinking that is focused on deciding what to believe or do" (p. 22). Similarly, Chaffee (2004) links critical thinking to decision making and states that thinking critically is a careful exploration of the thinking process to "clarify our understanding and make more intelligent decisions" (p. 313). Chaffee (2009) points out that to think critically is an intrinsic part of our natural human ability that supports discovering the way thinking operates. He also maintains that a critical thinker is a person who has the ability to take a deep cognizance of the real world, makes wise judgments, and is not afraid to offer opinions that differ from others.

Critical thinking is an ongoing process in which all language learners must engage, regardless of their language proficiency level. Pikkert and Foster (1996) state that English language learners should be equipped "with critical thinking skills that will enable them to evaluate and analyze constantly changing issues" (p.56). Furthermore, Kabilan (2000) suggests that for learners to be proficient language users they need to be able to think critically when using the target language. This suggestion implies that language learners should display critical thinking through the language. In the same line, Oster (1989) maintains that any language pedagogy should help learners develop critical thinking. Likewise, Mirman and Tishman (1988) assert that critical thinking should not be regarded as an entity to be taught separately, but rather as a skill that should be woven into any educational activity.

Conclusively, many scholars (e.g., Lian, 2000; Liaw, 2007; Luke, 2004, as cited in McLaughlin & Devoogd, 2004) have highlighted the importance of applying critical thinking in language teaching and learning. For example, Luke (as cited in McLaughlin & Devoogd, 2004) and Pennycook(1997) believe that learners should be critical when they attempt to make sense of text or discourse. Also Lian (2000) states that language learners need critical thinking skills to be able to confront, contrast, and contest their own perceptions with that of the real world. With regards to the importance of critical thinking ,a variety of approaches to teach critical thinking are presented in the literature among which one can name CALL and CMC. Many scholars (e.g., Crane, 2000; Harris, 1995; Thadphoothon, 2002) believe that use of CALL and CMC promote critical thinking and many (e.g., Black, 2005; Macknight, 2000; Thomas, 2002) have demonstrated or argued that text-based communications through the internet, which is a form of ACMC, can provide an environment to promote critical thinking.

There have been many reports on the cognitive benefits of implementing ACMC such as lively exchange of information, in-depth processing and critical thinking, and the opportunity to learn in a collaborative learning environment (Arnold & Ducate, 2006; Pawan, Paulus Yalcin, & Chang, 2003). Consequently, with respect to the importance of developing critical thinking in language learning and with the growing interest in CMC and ACMC in language teaching contexts, and the evidence put forth on the possible effect of ACMC on critical thinking, the present study aims to investigate whether asynchronous web-based discussions in a blended learning environment have any statistically significant effect on the development of EFL learners' critical thinking skills.

Research question and hypothesis

To fulfill the purpose of this study, the following research question was raised:

> *Does participation in asynchronous web-based discussions in a blended learning environment have any significant effect on EFL learners' critical thinking skills?*

In order to investigate the research question empirically, the following hypothesis was proposed:

> *H_0: Participation in asynchronous web-based discussions in a blended learning environment does not have any significant effect on EFL learners' critical thinking skills.*

Method

This study had a quasi-experimental design in which convenient non-random sampling was used. Moreover, the study had a pretest-posttest control group design.

Participants

The participants were 64 male and female intermediate EFL learners from a variety of academic backgrounds, ranging in age from 18 to 26, learning English at two branches of a private language school in country x and were placed in seven intact classes. Almost all learners were familiar with the basics of using computers and Internet, but the majority of them did not have any active participation experience in Internet discussion forums prior to this study. Only twelve learners in the two groups had such a prior experience.

The participants of this study were selected based on their performance on PET (Preliminary English Test), which was administered to 96 EFL learners to ascertain their homogeneity in terms of their general English language proficiency. Before the main administration, the PET was piloted in conditions similar to the main study to ensure its reliability for the target sample. The pilot group consisted of 30 participants of similar characteristics to the target group. Then, the piloted PET was administered to the target sample and 64 language learners whose scores fell within the range of one standard deviation above and below the sample mean were selected for the study.

In order to guarantee the reliability of the results for the speaking and writing sections of the PET, two raters scored the performance of the participants on these sections. The raters were one researcher and a bilingual teacher with more than four years of experience in teaching English.

After the process of homogenization, the selected participants were randomly assigned to two groups of 32 participants, the control group and the experimental group. They were scattered across seven classes.

All participants were taught by the same teacher who was one of the researchers. The students in the control group were taught following the SOP (Standard Operating Procedure) of the language school with in-class discussion assignments and without online discussion forums. In the experimental group, in addition to regular classroom instruction, students were required to use the online discussion forum outside the classroom.

Instruments

The instruments employed in this research included an English language proficiency test (PET), Peter Honey's critical thinking questionnaire, the textbook, and the web-based discussion forum.

Preliminary English Test (PET)

In order to carry out this study, a sample Preliminary English Test (PET) adopted from *PET Practice Tests* by Jenny Quintana (2003) and published by Oxford University Press was used as a general proficiency test to homogenize the participants in terms of their general English language proficiency. Before administering the test, it was piloted with a group of 30 EFL learners who were at the same language proficiency level as the participants of the study. Item analysis and reliability estimates were carried out after the pilot administration. Analysis of the results indicated that no item needed to be discarded. The piloted PET was then administered to participants of the study.

The PET included 35 matching, multiple-choice, true/false comprehension items for the reading passages in five parts plus seven open-ended items in the form of guided writing and extended writing in three parts (with one hour and 30 minutes allocated time); 25 Multiple choice, gap-filling, true/false listening comprehension items in four parts (with 35 minutes allocated time, including six minutes transfer time); and an interview as the speaking section which was divided

into four parts. The tasks in the speaking section included short exchanges with the interlocutor, a collaborative task, a one-minute long turn and a follow-up discussion (with 10–12 minutes allocated time). The overall time allotted to the three sections was almost two hours and twenty minutes.

Peter Honey's critical thinking questionnaire

Peter Honey's critical thinking questionnaire (See Appendix A) was used in this study to measure the participants' critical thinking skills and was administered as both the pretest and the posttest with the aim of identifying the possible impact of the treatment on the development of the critical thinking skill of the participants. This questionnaire is constructed by Honey (2005) with the purpose of evaluating the skills of analysis, inference, evaluation, and reasoning. The internal consistency of the questionnaire was calculated twice, after the pretest and after the posttest administrations through Cronbach's Alpha which came out to be .903 and .962 respectively. The questionnaire included 30 Likert type questions each followed by five alternatives including Never(1), Rarely(2), Sometimes(3), Often(4), and Always(5). Each participant's score could range from 30 to 150.

Textbook

The textbooks instructed in both groups (the experimental group and the control group) were *Top Notch 3* and *Top Notch 4* (Saslow & Ascher, 2006), depending on the sub-level at which the learners were studying English. These two books include the last four levels of the Top Notch six-level course for intermediate language learners. Each level is designed for 60 to 90 instructional hours and in this study, each level was instructed in two instructional terms with each term covering a quarter of the textbook in about 30 instructional hours (eight weeks).

Web-based discussion forum

The web-based discussion forum used in this study was an asynchronous communication tool involving a moderator user (the teacher) posting a question or assignment, and learners (participants in the experimental group) posting their responses at a later time. In this kind of discussion forum, learners are able to browse all posted topics. They can also enter the topic page to view the discussion messages and post responses just by clicking on a topic link.

Asynchronous web-based discussion forum was set up on the internet at *http://zarrinsadaf.forumotion.com* with the latest revision of the instrument. It was implemented at *http://www.forumotion.com* for this particular study from the beginning of the semester. *Forumotion* is a professional free forum hosting service. It offers the hosting on user preferred forum software. The website presents a free web-based environment and offers a free discussion forum platform. The Web 2.0 services provide an easy way to have a community without any maintenance and support tasks.

Procedure

To achieve the purpose of this study, the following steps were taken during the research process.

Pre-treatment stage

After piloting PET, the researcher administered it to all the available intermediate students (N=96) and 64 whose scores fell within ±1 standard deviation from the mean were selected. Therefore, the participants were selected based on convenient non-random sampling. The reliability of the closed-ended items of PET in the main administration was calculated as .92 through Cronbach's Alpha. The inter-rater consistency for part one and part two of the writing section and the speaking section of the PET came out to be .82, .78, and .86 respectively.

The selected participants were randomly assigned to two groups, the experimental group and the control group, with 32 participants in each.

Prior to the experiment, the researcher created a web-based discussion forum for the experimental group in *Forumotion.com,* a website offering forum hosting. It was implemented on the URL http://zarrinsadaf.forumotion.com with the latest services of the web 2.0 technology. Then, a technical manual was prepared for the participants demonstrating how to use the discussion forum effectively. The manual included three main parts: 1) how to register and log in the discussion forum, 2) how to post a topic or post a reply in the discussion forum, and 3) how to edit or delete a post. It also included a notification indicating that the participants needed to select the appropriate forum depending on which group they were in (Group A, Group B, or Group C) (See Appendix B).

The Honey's critical thinking questionnaire was administered to the experimental group and the control group prior to the treatment. Peter Honey's critical thinking questionnaire was used to measure the critical thinking ability of the participants. Since the participants in both groups were at intermediate level, the English version of the questionnaire was used in this study. However, the participants were guided through filling out the questionnaire. The time given for the 30 questions of the questionnaire was about 15 minutes.

Treatment stage

Prior to the commencement of the treatment, the teacher explained the requirements to the participants of both groups to eliminate any possible confusion. Therefore, in the second session, the participants in the experimental group received the discussion forum manual which was prepared by the researcher (See Appendix B). The teacher familiarized the learners in the treatment group with the discussion forum and the blended learning environment which they were supposed to engage in and informed them of the course requirements.

During the study, the participants in both groups received the same amount of instruction, the same method of teaching, and the same textbook (*Top Notch*).

Since discussions were considered as a classroom routine in such courses, the two groups differed only in the treatment that the experimental group received. The participants in the experimental group were asked to discuss some topics (See Appendix C) with their group members in the asynchronous web-based discussion forum and in a blended learning environment. Participants in the control group were asked to discuss the same topics with their classmates during the last 30 minutes of each session. It was estimated that each participant in the experimental group would spend 60 minutes a week participating in the web-based discussions. All the discussions in both groups were considered as their assignments.

Sixteen sessions were held twice a week for both groups. In order to have almost equal hours of exposure to English language and engagement in the course activities, it was decided that the participants in the control group receive 16 sessions of instruction each lasting for 105 minutes and the participants in the experimental group receive 16 sessions of instruction each lasting for 75 minutes. This 30-minute difference each session was set to compensate for the 60 minutes the participants of the experimental group would spend each week taking part in the discussion forums outside the class.

The learners in the experimental group were required to register on the http://zarrinsadaf.forumotion.com website in order to receive a username and a password for entering the discussion forum and participating in the discussions. Considering that the discussion forum is private or password protected, learners feel free to share their thoughts and opinions only with their classmates.

During the experimental process, the teacher posted discussion threads (topics) in the discussion forum. For the purpose of the study, it was essential to select topics which would motivate the participant discussions. The teacher selected the topics based on the participants' discussion

potentials, the interests of the learners, and the relevance to the learners' textbook lessons (See Appendix C).

The experimental group was randomly divided into three groups of 10 EFL learners. This was done in order to have a better control on the discussions and also to avoid the repetition of ideas in the posts. As a result, the participants only discussed with their own peers. The teacher posted three or four threads in the discussion forum on a weekly basis, and the participants in the experimental group were required to choose at least three topics to discuss with their peers during each week of the course.

The asynchronous nature of the web-based discussion forum allowed learners to participate in the discussions at different points in time during each week. Participants in the experimental group were encouraged to post new discussion threads relevant to the instructional content and to post their opinions along with reasons supporting their views. They were also able to browse all posted topics; they could also enter the topic page to view the discussion messages and post responses just by clicking on a topic link.

The teacher posted topics in the forum weekly and monitored the discussions in the experimental group in order to be informed and follow their progress. He did not interact with participants during discussions and he did not give feedback to them. Since the focus of this study was on the use of language to express thoughts rather than the correct use of the language, the teacher commented on some of the posts in which the participants gave grammatical feedback to each other in order to guide the exchange towards the *topic* of discussion rather than the *form* of the discussion. All discussions in the experimental group were in the written form (see Appendix D for samples).

The same topics were delivered to the control group. As mentioned before, the participants in the control group were asked to discuss the same topics with their classmates during the last 30 minutes of each class session. Since each sub-group in the experimental group consisted of around 10 participants, it was decided to have the same number of peers in each group in the control group. However, the three groups were in three different classes. The teacher presented three or four topics to the participants each week (one or two topics each session). The topics, like the ones in the experimental group, were in the form of question or statement. The teacher did not give any noticeable feedback to participants and only monitored the discussions so that the learners would communicate their thoughts rather than focusing on the language itself.

The discussions were in the written form in the experimental group while they were carried out orally in the control group. However, the main focus in both groups was the exchange of ideas and the reasoning which supported them, not the language they were using.

Post-treatment stage

Finally, at the end of this experiment, Honey's critical thinking questionnaire was administered to participants in both experimental and control groups in order to measure the treatment effects. The questionnaire in the posttest was exactly the same as the one used in the pretest. Of course, in the pretest participants were not told that they would take the same questionnaires at the end of the course.

Results

In order to see whether the improvement for the experimental group was significantly more than that of the control group, and since the participants were not homogenized in terms of their critical thinking prior to the treatment, the Analysis of Covariance (ANCOVA) was run. All assumptions of ANCOVA (normality of all the distributions, linearity between covariate and dependent variable, and homogeneity of regression slopes) were checked by ANCOVA analysis.

Table 1
Descriptive statistics of the pretest and posttest

		N	Mean		Std. Deviation	Skewness		
			Statistic	Std. Error	Statistic	Statistic	Std. Error	Ratio
Total CT Pretest	Experimental Group	32	83.94	.933	5.279	.095	.414	.229
	Control Group	32	87.69	2.489	14.08	.682	.414	1.647
Total CT Posttest	Experimental Group	32	111.69	2.108	11.923	-.351	.414	-.848
	Control Group	32	88.38	2.058	11.639	.674	.414	1.62

For the normality of the distributions, skewness ratios of all pretest and posttest scores were checked and as demonstrated in Table 1; they all fell within ±1.96. For the second assumption, the linear correlation coefficient was computed between the covariate (pretest scores) and the dependent variable (posttest scores), the results of which demonstrated significant correlation (r= .415, *p*= .001<.01). This showed the relation between the two variables was significantly linear.

For the third assumption, the interaction between covariate and the grouping variable was checked. In Table 2, the interaction between 'group *totalCTpretest' does not demonstrate a significant value (*F*= 1.953, *p*= .167> .05). Therefore, it is concluded that the slopes of the groups on the covariate are parallel enough and that there is homogeneity of regression.

Table 2
Test of homogeneity of regression slopes

Tests of Between-Subjects Effects, Dependent Variable: Total CT Posttest

Source	Type II Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	14008.389[a]	3	4669.463	85.066	.000
Intercept	236.011	1	236.011	4.300	.042
Group	2.868	1	2.868	.052	.820
TotalCTpretest	5205.604	1	5205.604	94.833	.000
group * TotalCTpretest	107.222	1	107.222	1.953	.167
Error	3293.549	60	54.892		
Total	657702.000	64			
Corrected Total	17301.937	63			

a. R Squared = .810 (Adjusted R Squared = .800)

Since all the assumptions were met, ANCOVA was run. The results are demonstrated in Table 3. The line for TotalCTpretest demonstrates that pretest scores were statistical covariate with a strong effect size ($F_{1,61}$= 93.374, p= .0005<.05, partial Eta Squared=.605, power=1). This means that the pretest scores did have a strong effect on how the participants performed on the posttest.

Table 3

Analysis of covariance for critical thinking improvement by asynchronous web-based discussions

Tests of Between-Subjects Effects, Dependent Variable: Total CT Posttest

Source	Type II Sum of Squares	df	Mean Square	*F*	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	13901.167[a]	2	6950.583	124.673	.000	.803	249.347	1.000
Intercept	1957.520	1	1957.520	35.112	.000	.365	35.112	1.000
TotalCTpretest	5205.604	1	5205.604	93.374	.000	.605	93.374	1.000
Group	10922.672	1	10922.672	195.921	.000	.763	195.921	1.000
Error	3400.771	61	55.750					
Total	657702.000	64						
Corrected Total	17301.937	63						

a. R Squared = .803 (Adjusted R Squared = .797)
b. Computed using alpha = .05

Moreover, the effect of group turned out to be significant as well ($F_{1, 61}$= 195.921, p= .0005<.05, partial Eta Square=.763, power= 1). This means that when posttest scores were adjusted for pretest scores, grouping was a factor in explaining variance in the model and since the mean posttest score of the experimental group was higher than that of the control group, when adjusted for the pretest scores, experimental group outperformed the control group on the posttest. Therefore, the null hypothesis that stated 'Participation in asynchronous web-based discussions in a blended learning environment does not have any significant effect on EFL learners' critical thinking skills' was rejected at .05 level. This finding had a strong effect size and power. The partial eta squared of .76 indicates that the treatment accounted for 76% of the variance in the critical thinking when comparing the control and experimental groups. Power of 1 is the strongest obtainable power.

Discussion

Since the participants in the two control and experimental groups were homogenized and randomly assigned to the two groups prior to the treatment, the final significant differences between their mean scores on the critical thinking questionnaire posttest and after taking into account the pretest covariate could be attributed to the treatment the experimental group received. This finding had a strong effect size and power.This means that the asynchronous web-based discussions have a strong effect on language learners' critical thinking skills.This result extends the previous empirical research documenting the beneficial effect of Internet or CALL activities on the learners' critical thinking skills (e.g., Black, 2005; Macknight, 2000; McLoughlin& Luca, 2000; Thadphoothon, 2002; Thomas, 2002; Yildiz&Bichelmeyer, 2003).

One justification for the findings might have been the asynchronous nature of the discussions. This justification is in line with what Branon and Essex (2001), Kol and Schcolnik (2008), Yildiz

and Bichelmeyer (2003) reported. Branon and Essex (2001) believed that ACMC encourages in-depth and thoughtful discussions among participants. Ware and O'Dowd (2008) believed that learners usually have more time to reflect on their partners' texts and to decide what was meant. So another justification could be the 'wait time'. This means that the asynchronous nature of the discussions gave the participants in the experimental group some time to think, and then to respond. Tobin (1987) stated that wait time has an impact on students' thinking.

Since one of the main characteristics of the asynchronous web-based discussion forums is their text-based nature, the findings could be attributed to this feature as well. The role of text-based communication in developing reflective conversations and critical thinking is discussed by some researchers (e.g., Havard, Du, & Olinzock, 2005; Lamy & Goodfellow, 1999; Redmon & Burger, 2004).

Another explanation for the finding might be the Internet environment that provides a new appealing learning environment which, according to McLoughlin and Luca (2000), grants the ultimate learning experience and the type of interaction in which the use of critical thinking skills becomes necessary.

To yet add to the justifications for the findings of this study, one may point to the discussion group size in the experimental group. In this study, the researchers had to form three groups of ten participants, whereas the recommended size of groups in online discussions is three or four (e.g., Bailey & Luetkehans, 1998; Peirce, 2000). It can be argued that having more participants in a group resulted in exposure to possibly more different ideas for each participant and thus promoting critical thinking skills; an argument which undoubtedly requires further investigation.

Finally it has to be mentioned that though limited in duration and scope, the results of this study clearly support previous studies regarding the effects of the asynchronous nature of communications (e.g., Gerbic, 2010; Kitade, 2008, Romiszowski & Mason, 2004; Yildiz & Bichelmeyer, 2003), questioning (Cotton, 2001; Dugar, 2010), 'wait time' (Elliot 1996; Moon, 2007; Tobin, 1987), metacognitive skills (Magno, 2010; Mirali Mortezaee, 2012), collaborative learning (Gokhale, 1995; Hosseini, 2009; Johnson & Johnson, 1986; Naeini, 2005; Arnold and Ducate, 2006), and CALL and Internet environment (Macknight, 2000; McLoughlin & Luca, 2000) on learners' critical thinking skills. Each of the above mentioned factors, as a built-in characteristic of asynchronous web-based discussion forum, could be one explanation for the findings of this study.

Conclusion

Critical thinking is widely recognized as a fundamental factor in general education (Ennis, 1992; Garrison, Anderson, & Archer, 2001; MacKnight, 2000; Moore, 2004; Shakirova, 2007) and many researchers (e.g., Alan & Stoller, 2005; Dugar, 2010; Gokhale, 1995; Hosseini, 2009; Johnson & Johnson, 1986; Kabilan, 2000; Macknight, 2000; McLoughlin & Luca, 2000; Mirman &Tishman, 1988; Naeini, 2005; Pikkert & Foster, 1996; Thadphoothon, 2002) have investigated practical working options to incorporate critical thinking skills in different instructional programs as well as in foreign language settings.

The findings of this study indicate that one solution to incorporate critical thinking in English language classes could be creating asynchronous web-based discussion forums and encouraging language learners to discuss topics in small groups through such a CALL facility.

Conclusively, while the existing literature and the previous studies have already provided some evidence regarding the effect of asynchronous discussions through Internet or CALL tools on the critical thinking of students in general and language learners in particular (e.g., Biesenbach-Lucas, 2003; Black, 2005; Branon & Essex, 2001; Hew & Cheung, 2008; Johnson, 2006; Kitade,

2008; Macknight 2000; McLoughlin & Luca, 2000; Romiszowski & Mason, 2004; Schwier & Balbar, 2002; Thomas, 2002; Wang, 2008), the present study supported the existing body of literature on the positive effects of such asynchronous discussions on EFL learners' critical thinking skills.

This research has implications for language teachers by motivating them to infuse critical thinking skills in their instructions using asynchronous web-based discussion forums in a blended learning environment. In fact, one of the main purposes of the study was to introduce an alternative way of improving critical thinking skills of language learners in EFL classes; a way that is not based on direct teaching of thinking skills, but is rather founded on weaving critical thinking skills into language learning routine.

Asynchronous web-based discussion forum (also called bulletin board, message board, asynchronous conference room, threaded discussion forum) is a powerful and easy-to-use tool to engage language learners in thoughtful discussions.

If the conclusions of this study hold true for language teachers, they hold important implications for curriculum developers and CALL designers in the realm of EFL teaching and learning as well. Generally, any online platform that serves such an asynchronous service allows the learners and teachers to create posts, edit them, or delete them easily, and they have more time to reflect on a topic or question before posting a message. This very characteristic of asynchronous discussion forums could, thus, be very appealing for curriculum developers in EFL settings.

Given the results of this study and the related literature, asynchronous online discussions are valuable experiences to both the students and the teachers and provide effective learning environments where critical thinking is triggered. Therefore, educators should actively seek the new technological platforms where asynchronous discussions are supported, whether it is a classic web-based discussion forum, an application on a Tablet device, or a social network service such as Facebook.

As a final remark it has to be noted that the findings of this study should be generalized with caution due to certain limitations which existed in the design of the study. First of all, due to the limited number of participants that the researchers had access to, homogenizing the participants based on their learning styles and degree of friendship, which are important factors in interaction among learners (Vass, 2002), was not possible. Therefore, the possible differences among the participants in terms of their learning styles and the degree of friendship as well as lack of anonymity, as another influential factor (Zhao, 1998), might have affected the findings of this study.

Based on the present study, the researchers suggest further studies on the comparative effect of asynchronous and synchronous web-based discussions on EFL learners' critical thinking. Moreover, it is recommended that further research studies compare the effect of other ACMC tools on EFL learners' critical thinking.

APPENDIX A.
Peter Honey's Critical Thinking Questionnaire

Name/ Last name: years of experience: institute:

Gender: Male … . Female … .. Major: Age:

Here are 30 statements exploring things you might or might not do when critically thinking about a subject. Simply read each description and click on the box to indicate how often you do it. The choices are:

☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

Be sure to mark every item.

1. I make notes on the important elements of people's arguments or propositions (e.g. the topic, issues, thesis and main points).
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

2. I test the assumptions underpinning an argument or proposition.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

3. I state my reasons for accepting or rejecting arguments and propositions
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

4. I put material I have read or seen into my own words to help me understand it.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

5. I distinguish between facts and opinions.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

6. I double-check facts for accuracy.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

7. I check other people's understanding of issues.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

8. I search for parallels and similarities between different issues.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

9. I use a set of criteria against which to evaluate the strength of the argument or proposition.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

10. I summarize what I have heard or read to ensure I have understood properly.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

11. I break down material so that I can see how ideas are ordered and raised.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

12. I assess the credibility of the person presenting the material I am evaluating.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

13. I play devil's advocate in order to improve my grasp of an argument or proposition.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

14. I set aside emotive language to avoid being swayed by bias or opinionated statements.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

15. I evaluate the evidence for an argument or proposition to see if it is strong enough to warrant belief.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

16. I explore statements for ambiguity to ensure I do not misconstrue their meaning.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

17. I challenge proposals and arguments that appear to lack rigour.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

18. I weigh up the reliability of people's opinions.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

19. I ask questions to reinforce my understanding of the issue.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

20. I establish the assumptions that an argument rests upon.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

21. I draw conclusions from data I have analyzed in order to decide whether to accept or reject a proposition or argument.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

22. I solicit input from other people to broaden my understanding of a subject.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

23. I analyze propositions to see if the logic is sound.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

24. I set aside my prejudices to evaluate arguments in a dispassionate, objective way.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

25. I distinguish major points from minor points.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

26. I look for what isn't there rather than concentrate solely on what is there.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

27. I reach my own conclusions rather than let myself be swayed by the opinions of others.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

28. I research a subject to enhance my understanding.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

29. I establish the underlying purpose of an argument or proposition.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

30. I consider new information to see whether I need to re-evaluate a previous conclusion.
☐ Never ☐ Rarely ☐ Sometimes ☐ Often ☐ Always

APPENDIX B
Discussion Forum Tutorial
How to use the discussion forum

http://zarrinsadaf.forumotion.com

Have you registered? You must register in order to log in. After the process of registration, you will receive username and password. You can easily log in using your unique username and password.

Where to begin

How do I post a topic or post a reply in the discussion forum?

Easy -- click the relevant button on either the forum or topic screens. You may need to register before you can post a message. The facilities available to you are listed at the bottom of the forum and topic screens (e.g. *You* can *post new topics,* You **can** reply to topics)

How do I edit or delete a post?

Unless you are the admin or forum moderator you can only edit or delete your own posts. You can edit a post (sometimes for only a limited time after it was made) by clicking the *edit* button for the relevant post. If someone has already replied to the post, you will find a small piece of text output below the post when you return to the topic that lists the number of times you edited it. This will only appear if no one has replied; it also will not appear if moderators or administrators edit the post (they should leave a message saying what they altered and why). Please note that normal users cannot delete a post once someone has replied.

IMPORTANT NOTE:

Select the right forum, depending on which group you're in (Group A, Group B, or Group C). Please avoid posting topics and replies in other groups. You are supposed to participate in all of your group discussions during each week.

APPENDIX C
Topics Used in the Discussion Forum

What are your reasons for learning English? what do you think is the most difficult aspect of learning English? Why?

Facebook... to be or not to be!!! (Let's share our views about Pros and Cons of Facebook as a huge online community.)

"Men only learned how to fly when they stopped imitating birds." (Do you agree with this statement? Discuss!)

Do you want to be rich? Yes? NO?!! Why?

Imagine that your friend is going to Britain without knowing a word of English. What difficulties would someone in this situation face? Would he/she be able to cope?

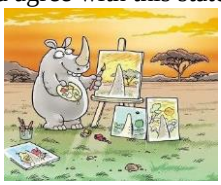
Is Facebook a good place for finding a friend? Discuss!

Which cellphone? Why? (I've been looking for a reliable phone with a beautiful design. After shuffling through several brands such as iPhone, Samsung, etc. I came to know I'm interested in Sony Ericsson, Share your experiences. We're going to have a logical discussion here, so don't promote your own phone! Discuss!)

Do you listen to sad music? What makes you do it?

What do you think of people's diet in Iran? Are people's diets getting better or worse?

"People are lonely because they build walls instead of bridges" (Do you agree with this statement? Discuss!)



What do you think about this cartoon...???

What is the best way to make people like you? Discuss!

Do you believe in true love? Have you ever experienced it? Discuss!

"The best way to get someone's attention is to ignore them." (Do you agree with this statement? Discuss!)

Can politicians be trusted? WHY?

"Marriage is losing too many's attention and gaining one's inattention!!!" (Agree? Why? Disagree? Never mind because it's true anyway!)

Do you think there should be just one love in our life? Discuss!

What kind of difference do you want to make in the world?

Do you think that women should work outside the home? Discuss!

What do you think about Iranian food? How healthy are they? How delicious are they?

Do you believe in the life after death? Yes? No? Why?

Do you think that TECHNOLOGY is changing our lives in a positive way?

Do you believe in astrology/horoscope? Discuss!

Do you think FASTING is good for our health? Discuss!

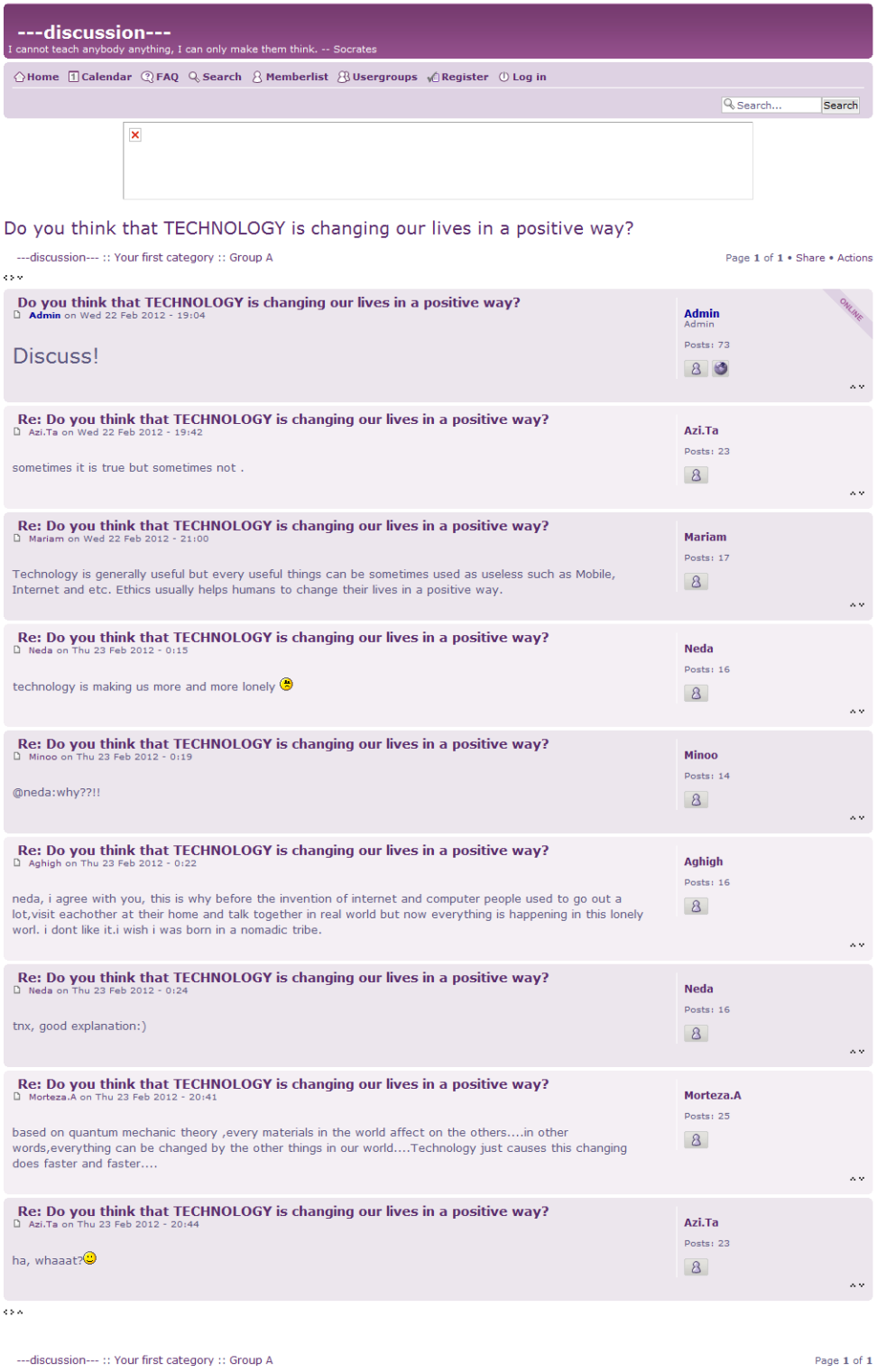
"If you fail to plan you plan to fail." (Do you agree with this statement? discuss!)

Why is Iran THE NOSE JOB CAPITAL OF THE WORLD?!!! Discuss!

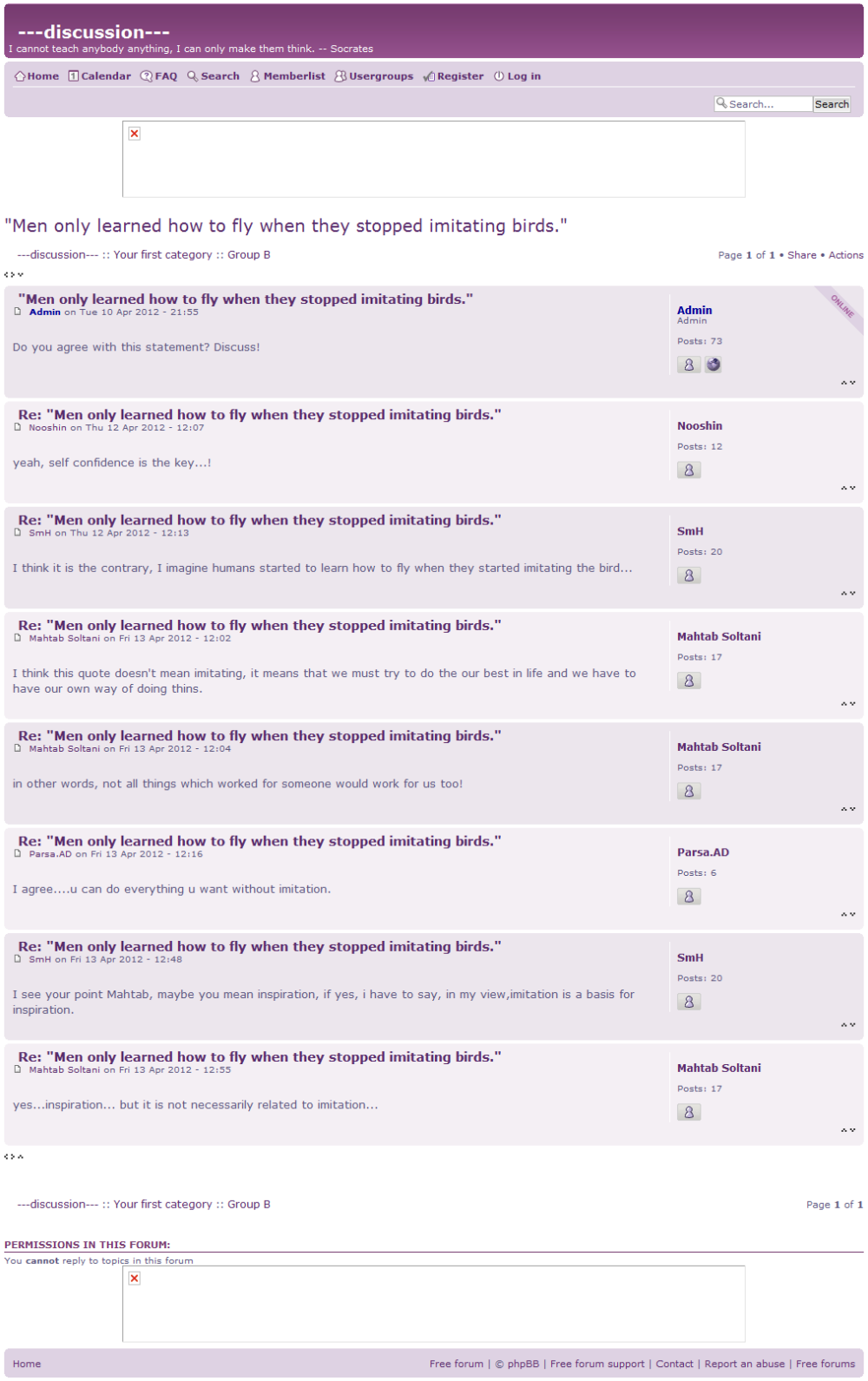
"Smart people know their strengths, but happy people are the ones who have accepted their flaws." (What do you think? Discuss!)

APPENDIX D
Discussion Samples

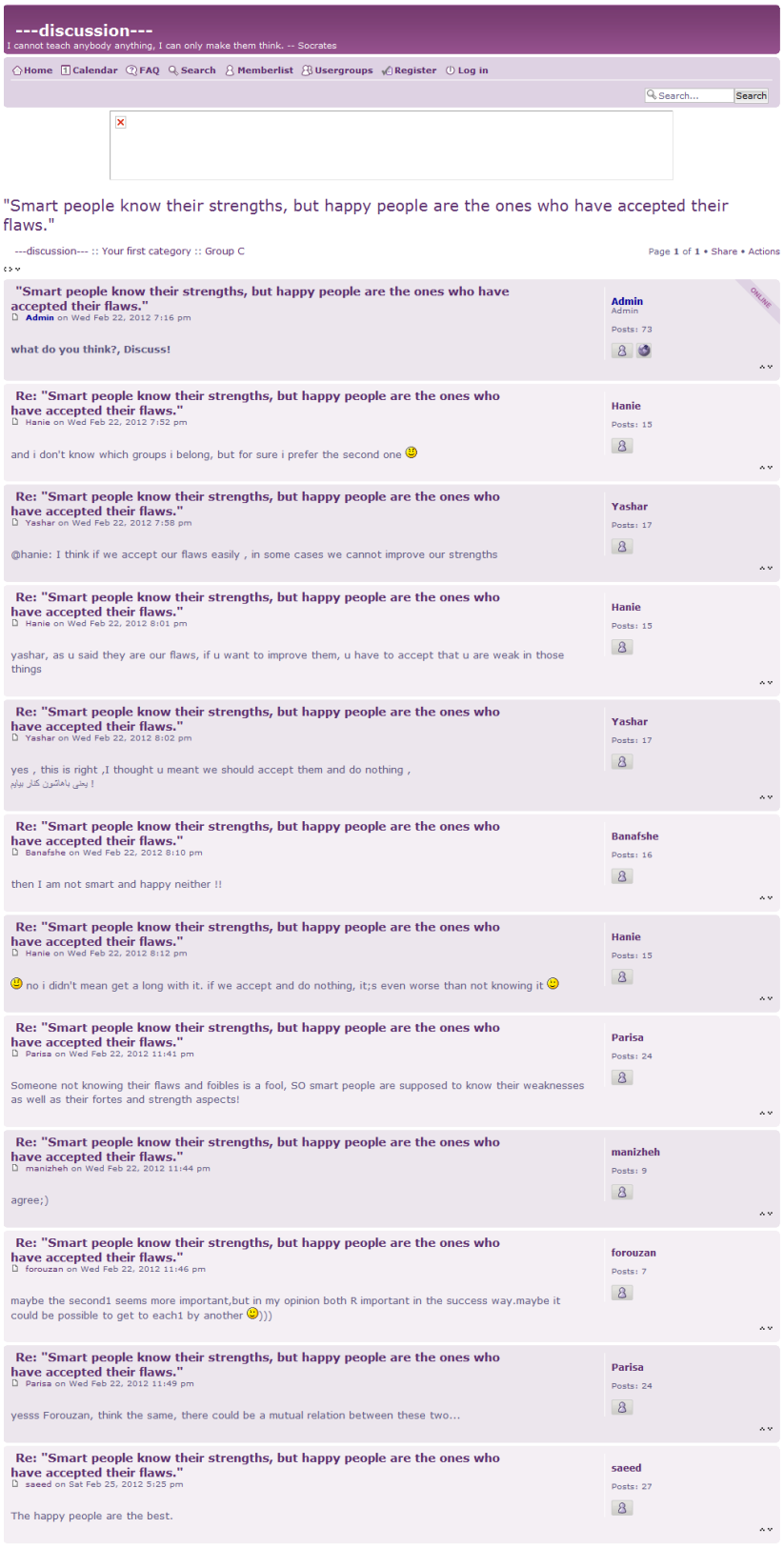
Sample 1



Sample 2


---discussion---
I cannot teach anybody anything, I can only make them think. -- Socrates
Home Calendar FAQ Search Memberlist Usergroups Register Log in
Search... Search
"Men only learned how to fly when they stopped imitating birds."
---discussion--- :: Your first category :: Group B
Page 1 of 1 • Share • Actions
"Men only learned how to fly when they stopped imitating birds."
Admin on Tue 10 Apr 2012 - 21:55
Do you agree with this statement? Discuss!
Admin
Admin
Posts: 73
ONLINE
Re: "Men only learned how to fly when they stopped imitating birds."
Nooshin on Thu 12 Apr 2012 - 12:07
yeah, self confidence is the key...!
Nooshin
Posts: 12
Re: "Men only learned how to fly when they stopped imitating birds."
SmH on Thu 12 Apr 2012 - 12:13
I think it is the contrary, I imagine humans started to learn how to fly when they started imitating the bird...
SmH
Posts: 20
Re: "Men only learned how to fly when they stopped imitating birds."
Mahtab Soltani on Fri 13 Apr 2012 - 12:02
I think this quote doesn't mean imitating, it means that we must try to do the our best in life and we have to have our own way of doing thins.
Mahtab Soltani
Posts: 17
Re: "Men only learned how to fly when they stopped imitating birds."
Mahtab Soltani on Fri 13 Apr 2012 - 12:04
in other words, not all things which worked for someone would work for us too!
Mahtab Soltani
Posts: 17
Re: "Men only learned how to fly when they stopped imitating birds."
Parsa.AD on Fri 13 Apr 2012 - 12:16
I agree....u can do everything u want without imitation.
Parsa.AD
Posts: 6
Re: "Men only learned how to fly when they stopped imitating birds."
SmH on Fri 13 Apr 2012 - 12:48
I see your point Mahtab, maybe you mean inspiration, if yes, i have to say, in my view,imitation is a basis for inspiration.
SmH
Posts: 20
Re: "Men only learned how to fly when they stopped imitating birds."
Mahtab Soltani on Fri 13 Apr 2012 - 12:55
yes...inspiration... but it is not necessarily related to imitation...
Mahtab Soltani
Posts: 17
---discussion--- :: Your first category :: Group B
Page 1 of 1
PERMISSIONS IN THIS FORUM:
You cannot reply to topics in this forum
Home
Free forum | © phpBB | Free forum support | Contact | Report an abuse | Free forums

Sample3 Graphic



Sample 3

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Editor's Note: This very detailed study is was conducted to support effective adoption of mobile learning technologies into higher education in Saudi Arabia. It recognizes the need for faculty and student training to use effectively use m-learning and difference in technology skills of students and teachers.

The degree of awareness of King Saud University's faculty members toward mobile learning

Hiam Al Tokhaim and Mansour Alwraikat
Jordan

Abstract

The purpose of this study was to determine faculty members' degree of awareness toward mobile learning in King Saud University and identify statistical significant differences of the study sample responses due to gender, academic rank, and academic experience. The sample of study consisted of 362 faculty members from King Saud University (52 males, 310 females) during the academic year 2012-2013. A questionnaire consisted of 29 items distributed on three dimensions that was developed to measure the degree of awareness. The results showed that faculty members have in general a high degree of awareness towards mobile learning, and there were no statistical significant differences in faculty awareness due to their gender, while there were statistically significant differences due to their academic rank (associate professor) and academic experience (16-20 years of experience).

Keywords: mobile learning, awareness, faculty, higher education.

Introduction and background

Mobile learning has become a common terminology in the field of education, with the spread of mobile phone technology through our society in general. M-learning is a new phase of e-learning. Great advances in information and communication technologies and proliferation of electronic knowledge among school and college students has led to emergence of new opportunities for learning, especially within the past decade with the advancement of learning and computer-based training tools, and the different methods of interaction with computers (Fathallah, 2012). The concept of learning is among the concepts and processes that were significantly affected by the development happening in this area; manifested with the emergence of many new forms of learning systems, notably m-learning systems (Hamami, 2006).

The degree to benefit from this new learning system in higher education is largely dependent on the degree of Knowledge (awareness) of m-learning, and possession of its skills by faculty members, namely lacking teaching and learning skills in m-learning by a large section of faculty in developing countries for many reasons, the most important the digital divide that separates between developing countries and developed countries.

This study emerged as a complementary to the efforts carried out by previous Arab studies to detect the behavior of Arab faculty towards this new model learning system. In this regard, awareness "refers to the learner's knowledge or subjective experience of a stimulus or cognitive content" (Al-Hejin, 2005, p. 3). It is also hoped that this current study will represent a breakthrough to present data for officials at King Saud University regarding the adoption of m-learning in the teaching and learning process since the concept of awareness according to Al-Hejin (2005), "is often associated with explicit versus implicit learning, since learners may or may not be aware that they have acquired a new structure" (p. 3), and to determine the extent of faculty members awareness and understanding of the inputs and outputs of m-learning since awareness may represent a gateway toward the prospects of the learning process.

The concept of M-learning

Mobile means "movable" which implies any negotiable movement. Accordingly, the term m-learning refers to learning through mobile or handheld devices, the word mobile is mostly concerned with mobile objects or portable devices such as cell Phones, PDA, Smart Phones, and portable Computers (Salem, 2006). Quinn (2000) defines it "It's e-learning through mobile computational devices: Palms, Windows CE machines, even your digital cell phone" (p. 1). In their effort to describe m-learning, Georgieva, Georgieva, & Smrikarov (2004) stated that:

> M-Learning must include the ability to learn everywhere at every time without permanent physical connection to cable networks. This can be achieved by the use of mobile and portable devices such as PDA, cell phones, portable computers and Tablet PC (p. 2).

Then, they asserted that these devices "must have the ability to connect to other computer devices, to present educational information and to realize bilateral information exchange between the students and the teacher" (p. 2).

Lehner, Nösekabel, & Lehmann (2002) define m-learning as “any service or facility that supplies a learner with general electronic information and educational content that aids in the acquisition of knowledge regardless of location and time” (p. 2). Traxler (2005) define it as " any educational provision where the sole or dominant technologies are handheld or palmtop devices" (p. 262). Litchfield, Dyson, Lawrence & Zmijewska (2007) define it as "the facilitation of learning and access to educational materials for students using mobile devices via a wireless medium" (p. 589). Oran & Karadeniz (2007) define it as "an education model in which education process is carried out fully or partially with mobile technologies' (p. 1). Traxler (2007) define it as "learning delivered or supported solely or mainly by handheld and mobile technologies such as personal digital assistants (PDAs), smart phones or wireless laptop PCs" (p. 4).

Previous definitions indicate that there is no one specific definition agreed and fixed for m-learning as a result of continuous change and evolution in technologies and mobile devices. Therefore, we can say that m-learning, by its very nature, is a new and advanced stage of distance learning and e-learning. It refers to the possibility of learning in every place and time through connecting via wireless technologies and mobile devices, (such as mobile devices, smart mobile devices, personal digital assistants, and laptops) in order to obtain, transport, supply, or educational material exchange between teacher and student.

Based on previous definitions we can summarize that m-learning is the learning that does not comply with the existing restrictions determinants in traditional learning in terms of time and place, a way to learn and teach, methods to stimulate interaction between participants in the learning process, and take into account the special needs of learners.

Benefits of mobile-learning

M-learning is characterized by its ability to increases motivation of students toward the learning process, help in the development of organizational skills, develop a sense of responsibility among students, and help to support the process of independent and cooperative learning. It is a reliable reference tool for documenting the progress of students learning, and delivering their educational assessment (Atwell, 2004, p. 5). The transition in education from the use of fixed computers to laptops equipped with Bluetooth and wireless services makes the learning more attractive for students. M-learning is characterized by its mobility, where students can take their mobile technology devices with its existing services such as wireless internet and Bluetooth, anywhere they want, and this enables them to access information and knowledge whenever and wherever they want. Thus, limited classrooms can be expanded to large-scale wireless networks.

M-learning is characterized by its support for social interaction, where the students communicate with each other, so that they can interact with each other better, and they can exchange information and cooperation with their peers face-to-face using cameras attached or integrated into their technical devices.

M-learning encourages individualized education. It provides the tools and means of assistance to students, which enables them to learn according to their individual differences with their peers, and the way that fits their educational style.

M-learning provides students with the opportunity to learn real things and events, through services provided by their technological devices. It enables students to obtain information, maps by GIS services, and information on the Internet. This makes education more attractive (Klopfer, Squire, and Jenkins, 2002).

Mobile education in its entirety is an educational resource to create more educational opportunities for individuals. It is low cost compared to traditional systems of education, without limiting individuals to a certain time or place, a specific group of learners, or with or a particular level or type of education. It is within the capacity of the learner to continue the journey to learn commensurate with his skills and previous experience, which enhances the concept of individual and self-learning and makes the learning process more democratic (Almahdi, 2008).

According to Corbeil (2007), m-learning supports students' learning experiences which are characterized as cooperative experiences. They are easily accessible and integrated educational experiences in the classroom. M-learning is useful for people who are not settled in a specific place because it occurs anywhere and anytime, encourages interaction between students and teachers and develop students' self-learning. It enables students with low academic achievement to fit in by utilizing multimedia. In addition, it reduces cultural barriers and facilitates communication between teachers and students by using the channels of communication favored by students to develop cooperation between all parties in the process of learning.

Attewell (2005) pointed out several benefits of m-learning. It helps in improving digital skills and knowledge of the learner, helps the learner to identify the skills and abilities of self, it can be used in the process of self and collaborative learning, and helps the learner to identify weaknesses, capabilities and skills they need for their development (self-learning). Moreover, helps to make the learning process an informal process, helps the teacher to focus for longer periods, and helps in raising the spirits of the learner and appreciation for himself and his self-confidence.

Mandeep (2010) believes that the benefits of m-learning are to constantly improve student information and encourage cooperation between students in the learning process. It replaces books. Therefore, the student can take it to anywhere, it provides equal learning opportunities for all students, and allows students to communicate with faculty members. It provides access to educational materials as soon as possible, and helps students in educational assignments and exams. It provides students with the opportunity to ask questions and submit queries to teachers, students and experts. M-learning helps in learning based on performance by the use of computers and electronic devices equipped with cameras and it helps in learning that occurs outside the classroom.

M-learning increases student involvement and passion for learning. It provides a way to individualize education for each student and take into account individual differences among learners, increases the opportunity for learning outside the classroom, and provides the learner the possibility of access to e-books. Increase in the level of computer skills of teachers and learners improve channels of communication between the learner and the teacher and the parents and increases the level of productivity of the teacher (Project Tomorrow, 2012).

Mobile communications unifies learning and the possibility of moving. The students' efficient use of these modern techniques increases interest of the educational community to take advantage of them. M-learning gives greater access to appropriate information when needed, reduces excessive cognitive pressure through learning skills and educational tasks, and increases interaction between the learner and his peers and regulations.

M-learning helps in the formation of cultural learning environment, which provides additional efficient means in increasing the learner's ability to learn and retrieve, and share the gained knowledge. M-learning takes into account the educational growth of the learner and learning styles and mental processes and motivation among students (Koole and Ally, 2006).

In theory, m-learning technology helps different groups of learners to increase their chances in education through access to knowledge. Such groups include individuals on the move, and persons with special needs who are suffering from motor disabilities prevent them from coming to educational institutions. In addition, it serves individuals who cannot afford to come and attend educational institutions due to the limitations of work or living conditions or other pressing priorities in their lives. M-learning facilitates the teaching and learning process by making it accessible and available; it enables learners to pursue their education based on their personal schedules and times suitable for them.

Mobility indicates that the process of learning is linked to specific dates of certain classes and lectures. M-learning enables individuals to learn at all times and all places during work breaks and night shift, and in the home …. etc. (Kinshuk, 2003).

Efficient use of information and communication technologies is essential to the success of this educational process to achieve the desired objectives. Faculty members play a vital role in the use of information and communications technologies in the educational process. This requires technical skills that will enable them to deal with various devices for teaching and managing the educational process. They should have positive attitudes toward technology and conviction of its importance in the context of the educational process (Philip, 2008).

Message center at King Saud University

Procedural definitions:

Literature review

Problem of the study and research questions

Research methodology

The population and sample of the study

Table 1

Distribution of faculty according to gender, academic rank, and experience.

Variables	Interval of Variables	Number	Percent
Gender	Male	52	14.4%
	Female	310	85.6%
	Total	362	100%
Academic rank	Full Professor	42	11.6%

	Associate Professor	99	27.3%
	Assistant Professor	97	26.8%
	Instructor	124	34.3%
	Total	362	100%
Experience	Less than 5 years	105	29.0%
	5 to 10 years	97	26.8%
	11 to 15 years	69	19.1%
	16 to 20 years	53	14.6%
	More than 21 years	38	10.5%
	Total	362	100%

Instrument of the study

A questionnaire was developed to measure the degree of awareness of faculty members towards the concept of m-learning through a review of the theoretical literature and previous studies that addressed the issue of the concept of m-learning. A four-point Likert scale ranging from strongly agrees to disagrees was used to measure the degree of awareness of faculty.

Validity

To verify the content validity of the questionnaire it was presented to (10) experts in the field of curriculum and instruction, and educational technology in the Hashemite Kingdom of Jordan and Saudi Arabia. Also, to determine the suitability and coverage of items for measuring the degree of awareness towards the concept of m-learning, and the extent of affiliation of items to the dimensions used in the study. In addition, to achieve the clarity and integrity of items language, as well as mention of any proposed amendments, proposed items deem necessary, and delete unnecessary items. Proposed amendments made by the experts in their recommendations were added, such as re-word and delete some items because of redundancy. In light of the amendments, the instrument consisted in its final draft of (29) items to measure the degree of awareness, distributed over three dimensions: the characteristics of m-learning, the pros and cons of m-learning, and comparing m-learning to traditional learning.

Reliability

Cronbach's alpha coefficient was calculated to measure the internal consistency of the three dimensions for the degree of awareness: m-learning characteristics (0.84), the pros and cons (0.66), m-learning compared to traditional learning (0.72), and for the questionnaire as a whole was (0.82). It is obvious that these medium values suitable for study purposes. Additionally, an item analysis was conducted to double check if items were highly correlated. These values are high and suitable for the purposes of the study. The dimension of the degree of awareness consisted of negative items: (17, 18, 19, 20, 21), and the rest were positive items.

The negative wording of items was taken into account in the questionnaire when debugging. Positive items direction take the mark as follows: strongly agree (4), Agree (3), Disagree (2), Strongly Disagree (1). While negative items direction as follows: Strongly agree (1), Agree (2), Disagree (3), Strongly Disagree (4). For the purposes of the current study, the researchers adopted

the views of experts in this field to calculate the degree of awareness of faculty members towards the concept of m-learning as follows:

The upper limit of alternatives for the scale in the instrument is (4), and a minimum of alternatives is (1). By subtracting the minimum upper limit equal to (3), and then dividing the difference between the two extremes on three levels, as shown in the following equation: 3 ÷ 3 levels (high, medium, low) = 1 and it will be: Minimum limit = 1 +1 = 2, average limit = 2 +1 = 3, and the upper limit = 3 or more. Thus, the weights for items as follows:

- Items that its means averaging between (3.01-4.00) means that the degree of awareness of faculty members to the concept of m-learning is high.
- Items that its means averaging between (2.01-3.00) means that the degree of awareness of faculty members to the concept of m-learning is medium.
- Items that its means averaging between (1.00-2.00) means that the degree of awareness of faculty members to the concept of m-learning is low.

Variables of the study

First: Independent variables: Gender: With two levels: Male, Female. Academic rank with four Levels: Professor, Associate Professor, Assistant Professor, Instructor. Experience: With five levels: Less of 5 years, 5 to 10 years, 11 to 15 years, 16 to 20 years, more than 21 years.

Second: the dependent variables: the degree of awareness of faculty members to the concept of m-learning measured through participants responses on the specified scale in the questionnaire.

Results

To answer the first research question, means, standard deviations, and ranking for responses for the degree of awareness for faculty in general were calculated, and for each dimension for the scale as a whole. Table 2 shows the degree of awareness of faculty toward the concept of m-learning.

Table 2
Means, standard deviations and ranking for faculty degree of awareness and the total score.

Dimension	Means	Standard Deviation	Ranking	Degree of Awareness
Characteristics of M-learning	3.40	0.51	2	high
Pros and Cons of M-learning	2.74	0.30	4	moderate
Comparing M-learning with Traditional learning	3.38	0.46	3	high
Total	3.23	0.44		high

Table 2 shows that the degree of awareness of faculty toward the concept of m-learning on the total score was high with a mean (3.23), and standard deviation (0.44). The dimension "characteristics of m-learning" was in the first place, with a mean (3.40), a standard deviation (0.51), and a high degree. Then "comparing traditional learning with m-learning" in the second, with a mean (3.38), a standard deviation (0.46), and a high degree. The "the pros and cons of m-learning," came in the third, with a mean (2.74), a standard deviation (0.30), and the medium degree.

As for each item of the three dimensions of the questionnaire, the results were as follows:

Characteristics of M-learning

Means, standard deviations, ranking for items of this dimension were calculated.

Table 3 shows that the degree of awareness for faculty toward m-learning for items of the dimension "characteristics of m-learning" were all within the high degree of awareness. The item "m-learning enables rapid connection for students to connect with the Internet" was in the first place in terms of the degree of awareness, with a mean (3.63), and a standard deviation (0.62), and a high degree. In second place was the item "m-learning requires students with desire to self-learning", with a mean (3.52), a standard deviation (0.76), and a high degree.

While the item "m-learning supports strengthening human and social relations between the teacher and the student" was ranked in the last with a mean (3.18), a standard deviation (0.93).

Table 3
Means, standard deviations for awareness, for items of the characteristics of m-learning

Number	Items	Means	St. D	Ranking	Degree of awareness
1	m-learning can be used anywhere anytime.	3.46	0.70	4	high
2	m-learning enhances interaction between the student and the teacher.	3.51	0.68	3	high
3	m-learning enhances the concept of individualized learning.	3.23	0.85	8	high
4	m-learning reduces the barriers between the student and the faculty member through using communication channels.	3.44	0.73	5	high
5	m-learning requires students with desire to self-learning	3.52	0.76	2	high
6	m-learning enables the student to have control in organizing the flow of information.	3.29	0.80	7	high
7	m-learning enables rapid connection for students to connect with the Internet	3.63	0.62	1	high
8	m-learning increases students' motivation and interaction with the subject.	3.34	0.84	6	high
9	m-learning supports strengthening human and social relations between the teacher and the student.	3.18	0.93	9	high
Total		3.4009	0.51002		high

The pros and cons of M-learning

Table 4 shows that the degree of awareness for faculty toward m-learning for items of the dimension "The pros and cons of m-learning" were all within the high degree of awareness, except for three items in the medium degree of awareness, as well as three items in the low degree of awareness. The item "m-learning easily enables the exchange of messages between learners" was ranked first in terms of the degree of awareness, with a mean (3.71), a standard deviation (0.62), and a high degree. The item "m-learning helps remodeling of educational material for students" ranked second, with a mean (3.49), a standard deviation (0.69), and a high degree. The item "m-learning reduces administrative load required by the teacher" was ranked in the seventh place, with a mean (2.92), a standard deviation (0.91), and a medium degree. While the item "rapid technological change of mobile hardware market making devices become old quickly", was ranked in the last, with a mean (1.51), a standard deviation (0.68), and low degree.

Means, standard deviations, ranking for items of this dimension were calculated as shown in. Table 4:

Table 4
Means, standard deviations for faculty awareness for items of the pros and cons of m-learning.

Number	Items	Mean	St. D	Ranking	Degree of awareness
1	m-learning helps remodeling of educational material for students	3.49	0.69	2	high
2	m-learning helps students to take responsibility.	3.28	0.83	5	high
3	m-learning easily enables the exchange of messages between learners	3.71	0.62	1	high
4	m-learning reduces administrative load required by the teacher.	2.92	0.91	7	moderate
5	m-learning brings more activities to traditional lessons which bring vitality and attraction of scientific material and learning environment.	3.31	0.84	4	high
6	m-learning enhances interaction between students.	3.48	0.78	3	high
7	m-learning enhances student's ability to make decisions.	3.06	0.84	6	high
8	m-learning requires more planning compared to the normal learning.	1.88	0.96	10	low
9	m-learning facilitates cheating among students.	2.06	1.03	9	moderate
10	m-learning gives preference for smart students.	2.61	1.02	8	moderate
11	m-learning requires the presence of students who have desire to self-learning.	1.55	0.82	11	low
12	rapid technological change of mobile hardware market making devices become old quickly	1.51	0.68	12	low

Comparing M-learning with traditional learning

Means, standard deviations, ranking for items of this dimension were calculated.

Table 5 shows that the degree of awareness for faculty toward m-learning for items of the dimension "Comparing M-learning with traditional learning" were all within the high degree of awareness, except one item within the medium degree of awareness. The item "m-learning facilitates access to information and educational experiences quicker than traditional learning" was ranked first in terms of the degree of awareness, with a mean (3.66), a standard deviation (0.64), and a high degree. The item "m-learning achieves participation and cooperation between the students and their teachers despite the difference in time and place" was in the second place, with a mean (3.57), a standard deviation (0.68), and a high degree. While item "m-learning supports educational integrated content theoretically and practically" was in the last, with a mean (2.97), a standard deviation (0.92), and a medium degree. The item "m-**Table 5**

Means, standard deviations, and ranking for faculty awareness for items of the comparing m-learning with traditional learning.

Number	Items	Means	St. D	Ranking	Degree of awareness
1	m-learning facilitates mobility during learning compared to traditional learning.	3.56	0.65	3	high
2	m-learning facilitates access to information and educational experiences quicker than traditional learning	3.66	0.64	1	high
3	m-learning supports educational integrated content theoretically and practically	2.97	0.92	8	moderate
25	m-learning breaks the psychological barriers towards learning process, making it more attractive.	3.46	0.71	4	high
5	m-learning achieves participation and cooperation between the students and their teachers despite difference in time and place	3.57	0.68	2	high
6	m-learning requires more planning compared to traditional learning.	3.27	0.98	6	high
7	m-learning provides more time compared to traditional learning.	3.38	0.82	5	high
8	-learning pr m-learning provides continuous assessment of student learning more than traditional learning	3.19	0.79	7	high
Total		3.38	0.45		high

M-learning provides continuous assessment of student learning more than traditional learning" was ranked before the last, with a mean (3.19), a standard deviation (0.79), and a high degree.Through the review of the previous year for the tables shown a high degree of awareness of the faculty at King Saud University for m-learning.

Results for the second question

To answer this question and an independent sample t-test was performed to examine the significance of any difference between the means with regard to faculty gender. In addition, a one-way analysis of variance (ANOVA) was conducted to find any statistically significant differences in mean scores between the faculty with regard to their academic rank and experience. The following is a presentation of the results by each variable separately:

First: Gender of faculty:

To determine any significant differences between the mean scores of faculty estimates to their degree of awareness toward m-learning, means, standard deviations of the sample estimates with regard to gender (male, female), were calculated. In addition, an independent samples t-test was performed to test the significance of any difference between the means. The results were as shown in the Table 6.

Table 6
Results of t-test for faculty's degree of awareness with regard to gender

Dimensions	Male			Female			t	Df	Sig.
	Number	Means	St. D	Number	Means	St. D			
Characteristics of m-learning	52	3.43	0.42	310	3.40	0.52	0.404	360	0.686
Pros and cons of m-learning	52	2.68	0.33	310	2.75	0.29	-1.530	360	0.127
Comparing m-learning with traditional learning	52	3.39	0.45	310	3.38	0.46	0.134	360	0.894
	52	3.11	0.33	310	3.12	0.35	-0.308	360	0.758

Table 6 implies that means scores indicate that there are differences in faculty estimates in their degree of awareness toward m-learning. Results of t-test showed no statistically significant differences between the mean estimates of faculty with regard to gender on all the three dimensions of awareness toward m-learning, and on the total score. The value of calculated t were between (0.134) and (1.530), these values are not statistically significant (at $p < 0.05$). In the sense that the degree of awareness of faculty toward m-learning is the same regardless of their gender.

Second: Academic rank:

To determine any significant differences between the mean estimates of faculty of their degree of awareness toward m-learning, means and standard deviations for faculty estimates with regard to their academic rank (Professor, Associate Professor, Assistant Professor, Instructor) were calculated, and the results were as shown in Table 7.

Table 7
Means, standard deviations for faculty estimates of their degree of awareness with regard to academic rank

Academic rank	Professor		Associate professor		Assistant professor		Instructor	
	Means	St. D	Means	St. D	Means	St. D	Means	St. D
Characteristics of m-learning	3.32	0.48	3.50	0.44	3.22	0.68	3.49	0.34
Pros and cons of m-learning	2.73	0.21	2.74	0.28	2.72	0.36	2.75	0.28
Comparing m-learning with traditional learning	3.35	0.42	3.37	0.37	3.34	0.60	3.44	0.39
Total	3.08	0.28	3.15	0.29	3.05	0.48	3.17	0.26

Table 7 indicates that there are differences in means scores of the faculty estimates in their degree of awareness toward m-learning with regard to their academic rank on all the three dimensions, and on total score of the scale. To determine any significant differences between the mean estimates of faculty of their degree of awareness toward m-learning with regard to their academic rank (Professor, Associate Professor, Assistant Professor, Instructor) a one-way analysis of variance (ANOVA), was performed. The results were as shown in Table 8.

Table 8
Results of One-way analysis of variance (ANOVA) for faculty with regard to their academic rank.

Dimensions Academic rank	Difference of means	Sum of squares	Df	Mean square	F	P
Characteristics of m-learning	Between groups	5.277	3	1.759	7.105	0.000
	Within groups	88.628	358	0.248		
	Total	93.905	361			
Pros and cons of m-learning	Between groups	0.030	3	0.010	0.112	0.953
	Within groups	31.844	358	0.089		
	Total	31.874	361			
Comparing m-learning with traditional	Between groups	0.710	3	0.237	1.138	0.334
	Within groups	74.449	358	0.208		
	Total	75.158	361			
Total	Between groups	0.953	3	0.318	2.676	0.047
	Within groups	42.505	358	0.119		
	Total	43.458	361			

Results in Table 8 indicated that there were no statistical significant differences for the dimension "Pros and cons of m-learning", where $p = (0.953)$, (at $p < 0.05$). Also, there were no statistically significant differences for the dimension "Comparing m-learning with traditional learning", where $p = (0.334)$, (at $p < 0.05$). This implies that faculty degree of awareness toward m-learning for the two mentioned dimensions are the same despite their academic rank. In addition, there were statistically significant differences for faculty estimates of their degree of awareness toward m-learning due to their academic rank on the dimension of the total score of the scale, where $p = (0.047)$, (at $p < 0.05$), and for the dimension "Characteristics of m-learning", where $p = (0.000)$, (at $p < 0.05$).

The Tukey test for *post-hoc* comparisons was used to determine where the differences in means lie in terms of faculty academic rank. The results showed that associate professors were more aware of m-learning with regard to the "Characteristics of m-learning" than professors, assistant professors, and instructors. And associate professors are more aware of m-learning with regard to the "Pros and cons of m-learning" than professors, assistant professors, and instructors.

Third: experience of faculty

To determine any statistically significant differences between the means of faculty estimates of their degree of awareness to ward m-learning, means, standard deviation were calculated for faculty estimates with regard to their experience (less than 5 years, 5-10 years, 11-15 years, 16-20 years, more than 21 years), and the results were as shown in Table 9.

Table 9
Means, standard deviations for faculty estimates on their degree of awareness with regard to their experience.

Dimensions	Less than 5 years	5 to 10 years	11 to 15 years	16 to 20 years	More than 21 years

Academic rank	Mean	St. D	Mean	St. D	Mean	St. D	Mean	St. D	Mean	St. D
Characteristics of m-learning	3.47	0.40	3.35	0.60	3.34	0.45	3.61	0.40	3.11	0.59
Pros and cons of m-learning	2.79	0.26	2.77	0.27	2.71	0.27	2.73	0.23	2.51	0.42
Comparing m-learning with traditional learning	3.44	0.42	3.34	0.54	3.43	0.37	3.34	0.38	3.25	0.51
Total	3.19	0.28	3.11	0.41	3.11	0.29	3.18	0.26	2.91	0.46

Result in Table 9 showed that there were statistical significant differences in means for faculty estimates on their degree of awareness toward m-learning with regard to their experience on all the dimensions and for the total score for the scale. To determine any significant differences between the mean estimates of faculty of their degree of awareness toward m-learning with regard to experience, a one-way analysis of variance (ANOVA), was performed. The results were as shown in (Table 10).

Table 10

Results of one-way Analysis of Variance (ANOVA) for faculty estimates of their degree of awareness toward m-learning with regard to their experience

Dimensions Academic rank	Difference of means	Sum of squares	Df	Mean square	F	P
Characteristics of m-learning	Between groups	6.449	4	1.612	6.581	0.000
	Within groups	87.456	357	0.245		
	Total	93.905	361			
Pros and cons of m-learning	Between groups	2.399	4	0.600	7.264	0.000
	Within groups	29.475	357	0.083		
	Total	31.874	361			
Comparing m-learning with traditional	Between groups	1.436	4	0.359	1.738	0.141
	Within groups	73.722	357	0.207		
	Total	75.158	361			
Total	Between groups	0.883	4	0.221	3.068	0.017
	Within groups	25.696	357	0.072		
	Total	26.579	361			

Table 10 showed that there were no statistical significant differences between faculty estimates of their degree of awareness toward m-learning with regard to experience for the dimension "Comparing m-learning with traditional learning", where $p = (0.141)$, (at $p < 0.05$). This means that faculty awareness is the same regardless of their experience.

Table 10 showed that there were statistical significant differences between faculty estimates due to their experience for the dimensions "Characteristics of m-learning", where $p = (0.000)$, (at $p < 0.05$), and "Pros and cons of m-learning", where $p = (0.000)$, (at $p < 0.05$), and for the total degree for the scale, where $p = (0.017)$, (at $p < 0.05$). This means that faculty awareness for these dimensions varies according to their experience.

The Tukey test for post-hoc comparisons was used to determine where the differences in means lie in terms of faculty experience. The results showed that the estimate of faculty with 16 to 20 years' experience is the most significant to the degree of awareness toward m- learning for the dimension "characteristics of m-learning". The views of faculty with less than 5 years' experience is the most significant to the degree of awareness toward m-learning for the dimension "pros and cons of m-learning".

Results and discussion

First: discussing the results of the first question:

The results showed that the mean scores of the dimensions of the degree of awareness of faculty toward m-learning were high. The "Characteristics of m-learning" was ranked first with a high degree, followed by "Comparing m-learning with traditional learning" was high, but the "Pros and cons of m-learning" was moderate. These results agreed with the results of Yilmaz1 and Akpinar (2013), and Wallace, Clark, White (2012) and the results by (Uzunboylu, Ozdamli 2011) which showed that the attitudes and awareness of teachers toward using m-learning in public education in Cyprus was moderate. It conflicted with results of the study conducted by (Oguz, 2012), which aimed to identify teachers attitudes toward m-learning at the University of Cyprus with regard to gender and scientific department, which showed that attitudes of teachers were low.

The degree of awareness of faculty for the dimension "Characteristics of m-learning" was high, and the item "M-learning enables students to have rapid access to the Internet" was in first place in terms of the degree of awareness. The researchers may attribute that m-learning is mainly dependent on the Internet in most applications. It is worth noting that all the items of this dimension had high scores.

The degree of awareness of faculty for the dimension "Pros and cons" of m-learning" was moderate. Three items were moderate, three items were low, and six items were high. The items "M-learning facilitates easy exchange of messages among learners" was ranked first in terms of awareness. The researchers may attribute that m-learning contributes actively in the exchange of experiences and information via electronic applications used between students and teachers.

The degree awareness of faculty for the dimension "Comparing m-learning with traditional learning" was high. Only one item had a moderate score. The item "M-learning enables quick access to information and educational experiences than traditional learning" was ranked first in terms of awareness. The researchers may attribute that to the tremendous development made in the electronic educational revolution, which enables learners to access information without relying on a single source such as a library, teacher or himself.

The faculty awareness of modern things became an urgent and necessary need, since being in touch with the students and give them instructions on how to follow the lectures, or answering their questions became very important. It is worth noting that there is a difference in the extent of knowledge among faculty with the awareness and advantages and disadvantages of m-learning. The learning process is witnessing a rapid change, so faculty members are expected to be ready and aware of all technologies that serve the educational field, especially m-learning, to keep pace with emerging issues.

Second: discussing the results of the second question:

The results concluded that there were no statistical significant differences due to the effect of gender in all dimensions. These results are similar to Wang, Wu, and Wang (2009) and Oğuz‹ (2012). The results indicated that the degree of awareness of faculty toward m-learning in all

dimensions, "the pros and cons of m-learning, and comparing m-learning with traditional learning" are the same, regardless of their academic rank.

The results showed that there were statistical significant differences in faculty estimates of their degree of awareness toward m-learning due to their academic rank on the dimension "Characteristics of m-learning" in favor of associate professors. The researchers may attribute that to the fact that faculty awareness increases with the level of their academic rank to a certain extent. Where academic rank offers impetus to faculty to be familiar with the latest development in technology, and the rank may represent a challenge to faculty to get to know the nature of m-learning for fear of being accused of not keeping pace with new technologies. In addition, associate professors need to increase publication of scientific research and use m-learning in the process of communicating with their students and colleagues to gather information.

The results indicate there were no statistically significant differences in faculty estimates of their degree of awareness toward m-learning due to their experience for the dimension "Comparing m-learning with traditional learning". Researchers may attribute that to the fact that experience is an important factor increasing awareness of faculty members to move towards m-learning. Experience is the accumulation of knowledge. The old knowledge held by faculty, together with the current experience, increase their ability to communicate and make contact. They are aware that it facilitates learning and communication through broadcasting lectures, facilitating student discussion, reviewing student projects, and feedback.

The results showed that there were statistically significant differences in faculty estimates of their degree of awareness toward m-learning due to their experience for the dimension "Characteristics of m-learning" in favor of faculty with 16 to 20 years of experience, and for the dimension "Pros and cons of m-learning" in favor of faculty with less than five years of experience. The researchers may attribute that to the fact it may be difficult for some old faculty to deal with modern appliances, and therefore to have the awe of use, which limits the use of such devices, or knowledge to deal with this technology and its programs and accessories. And who knows this technology better are younger faculty who are not afraid of new technologies. They may have less experience in the educational field, but they know how to use these devices.

The needed infrastructure is being established for m-learning in educational sectors. M-learning software is being applied more broadly in Saudi universities because of its immense benefits to the educational process, especially learning and teaching.

Training courses and workshops facilitate activation of this type of learning in the educational sector and fine-tune computer skills of teachers and learners to meet the requirements of m-learning. Research is continuing to overcome obstacles in adopting mobile learning in the educational process.

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Toward a Taxonomy of Distributed Learning Delivery Modes

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Abstract

The massive integration of technology-mediated delivery modes into higher education is reconfiguring the traditional face-to-face content delivery paradigm. To fully exploit the transformative power of distributed learning delivery modes, it is imperative for policy-makers, administrators, practitioners, and faculty to understand their characteristics, requirements, benefits, and drawbacks. In order to contribute to this understanding, this paper proposes a taxonomy that classifies various delivery methods based on four dimensions: location, time, pedagogy, and technology. The author hopes that this contribution will allow institutions of higher education to better understand the technical, pedagogical, and logistical characteristics of each delivery mode, and that this understanding will enable educators to blend several delivery modes to offer more effective learning experiences to their students.

Keywords: distance education; distributed learning; delivery modes; e-learning; online learning; Web-based learning; taxonomy.

Introduction

At the risk of stating the obvious, the current infusion of technology is reconfiguring the higher education landscape, transforming teaching, learning, and administration (CAUDIT, EDUCAUSE, JISC, & Foundation, 2010, Anderson & Weller, 2013). Driven by pressures, needs, and expectations from students, industry, and the society at large, the most obvious manifestation of this sea of change is the widespread adoption of technology-mediated delivery modes. Since this adoption takes the concept of "classroom" beyond conventional distance education, it is expanding access and is easing constraints in enrollment capacity, even as it contributes to institutional transformation, revenue generation, and renewal (Daniel, 1999; Oblinger, Barone, & Hawkins, 2001).

The traditional face-to-face paradigm is being reconfigured and augmented by technology-mediated delivery modes, including the massive open online courses (MOOCs) model (Daniel, 2013). As a result, universities are increasingly able to diversify their offerings and scheduling opportunities by providing a mix of face-to-face, Web-based, and hybrid courses. This diversification has significant implications for academia, since a variety of delivery modes are becoming more and more interwoven into the everyday fabric of academic life, particularly as higher education institutions attempt to take advantage of the repertoire of pedagogical approaches offered by these delivery modes (Dede, 2000; Malikowski, 2008).

Unless universities make an effort to re-examine, rethink, and remap these various delivery modes to meet curriculum needs and support student learning style preferences and needs (particularly those of part-time adult learners), they are unlikely to be able to fully benefit from the potentially transformative power of these pervasive (although sometimes disruptive) technologies.

In order to benefit from this influx of technology, any higher education institution (HEI) endeavoring to blend technology-mediated delivery modes into its teaching and learning

landscape must understand features, requirements, benefits, and drawbacks of the various delivery modes. To contribute to this understanding, this paper proposes a taxonomy which classifies, compares, and contrasts a variety of delivery modes following four dimensions: location, time, pedagogy, and technology. This paper's goal is threefold:

1) Fill a significant gap in the literature, since a thorough perusal of a large number of studies about distance education (DE) did not unearth a comprehensive comparative review of various delivery modes;
2) Enable policy-makers, practitioners, administrators, and faculty to consider and understand the technical, pedagogical, and logistical requirements of various delivery modes; and
3) Provide faculty with a comparative tool to help them avoid the mere transposition of face-to-face pedagogical practices into technology-mediated delivery modes and capitalize on advantages of specific media. Also, this tool should enable faculty to overcome skepticism and lessen their hesitation and anxieties about the quality and legitimacy of distance education (DE) courses.

This paper briefly defines the concept of distributed learning and then discusses basic assumptions underlying the proposed taxonomy. Next, it examines the core dimensions associated with distributed learning. Building on these dimensions, the paper describes various facets of a variety of delivery modes, explores their benefits and drawbacks, and concludes with some practical recommendations.

Distributed learning delivery modes taxonomy

Just what is distributed learning, anyway?

Although education literature abounds with various concepts and appellations (Moore, Dickson-Deane, & Galyen, 2011), *distance education* has traditionally served as an umbrella term for most non-traditional delivery modes. Despite ambiguity surrounding the definition of *distance education*, it is still justifiable (given the current trend toward technology convergence) to presume that the term *distance education* subsumes several related concepts, among them distance learning, online learning, e-learning, virtual education, Web-based learning, computer-based training, and blended or hybrid learning (Abdous, 2009; Abdous & Yoshimura, 2010). While keeping in mind some of the nuances associated with each concept (education vs. training, faculty-centered vs. student-centered, for example), the author opts for a more inclusive concept, one capable of incorporating face-to-face delivery mode. This paper uses the concept of distributed learning (DL), rather than pure distance education. Adding to this choice, it should be noted that learning (whether at a distance or face-to-face) is not mechanically delivered per se, but rather is an interactive individual and social process facilitated by faculty, mediated by technology, and intentionally initiated and accessed by students.

Broadly defined, distributed learning refers to "educational activities orchestrated via information technology across classrooms, workplaces, homes, and community settings" (Dede, 2000). In this understanding of distributed learning, educational activities tend to blend the complementary strengths of face-to-face instruction with technology-mediated synchronous and asynchronous interaction and communication. This allows learning to be distributed over space and time and extend beyond the classroom environment by using different technologies "to reach students where ever they are, physically as well as cognitively" (Walker, 2003).

However, the proliferation of various technologies to facilitate synchronous and asynchronous interaction and communication makes it difficult to comprehend all of the features, requirements, benefits, and drawbacks of each delivery mode. Adding to this confusion is the burgeoning

propagation of a variety of social networking applications (such as Facebook, Twitter, and Google Plus). While they are only beginning to penetrate into mainstream teaching and learning practices, these communication options are widely used by students outside of their academic learning activities. With their powerful potential to reconfigure the dynamics of participation, interaction, and collaboration, these social networking applications are likely to contribute to the emergence of a more diverse and complex learning landscape (Ravenscroft, 2009).

In the next section, this paper explains the assumptions underlying the proposed taxonomy, looks at some commonalities and differences observed across a variety of delivery modes, and examines features and requirements upon which these delivery modes are based. It considers content presentation, learning activities, synchronous/asynchronous interaction, assessment, and hardware and software requirements, as well as potential benefits and drawbacks for both students and faculty.

Distributed learning taxonomy

Keeping in mind the basic premise of taxonomies (the establishment of relationships between various items under consideration), the author posits that the proposed taxonomy provides a framework to systematically review, classify, and compare various delivery modes. At the outset, please note that this taxonomy is structured around three premises:

1. Since they occur in a very complex cultural and technological context, teaching and learning are multidimensional by nature. They are affected by a mix of institutional, social, and individual variables, ranging from institutional resources and faculty teaching styles to student background, readiness, and motivation.
2. Keeping in perspective the predominant role played by technology in teaching and learning, it is important to remember that technology is not merely a passive tool, nor a partial artifact (Harpur, 2006), but rather a "medium of human expression" (Murphy, 1986) which is capable of shaping our habits of mind and our patterns of thinking (Morrisett, 1996). Hence, in order to leverage the potential of technology to improve students' learning outcomes, it is critically important to understand the capabilities and limitations of various technologies, particularly when the ever-evolving nature of technological innovations is considered (Ravenscroft, 2009).
3. Recognizing the transversal nature of the taxonomy dimensions, the author concedes that these dimensions are not mutually exclusive. While this paper attempts to provide a means to compare and contrast a variety of delivery modes, there is still a degree of overlap and redundancy across the four dimensions under consideration: location, time, pedagogy, and technology.

The author, having clarified these assumptions, reiterates that taxonomies provide a basis for explaining and presenting complex information, but also for understanding organizational phenomena (Martín-Peña & Díaz-Garrido, 2008). In this sense, this proposed taxonomy is useful in helping to understand and map the characteristics and the differences among various teaching and learning delivery modes.

To contextualize the proposed taxonomy, the reader should note that it is inspired by the distributed learning environment of a public four-year research university known as a national leader in technology-mediated distance learning. At this institution, courses are delivered via a wide range of technological delivery modes that include satellite broadcast courses, two-way video courses, web-based courses, live video streamed courses, and courses offered via CD-ROM and other portable devices. This taxonomy is grounded in four intertwined dimensions: location, time, pedagogy, and technology (Figure 1).

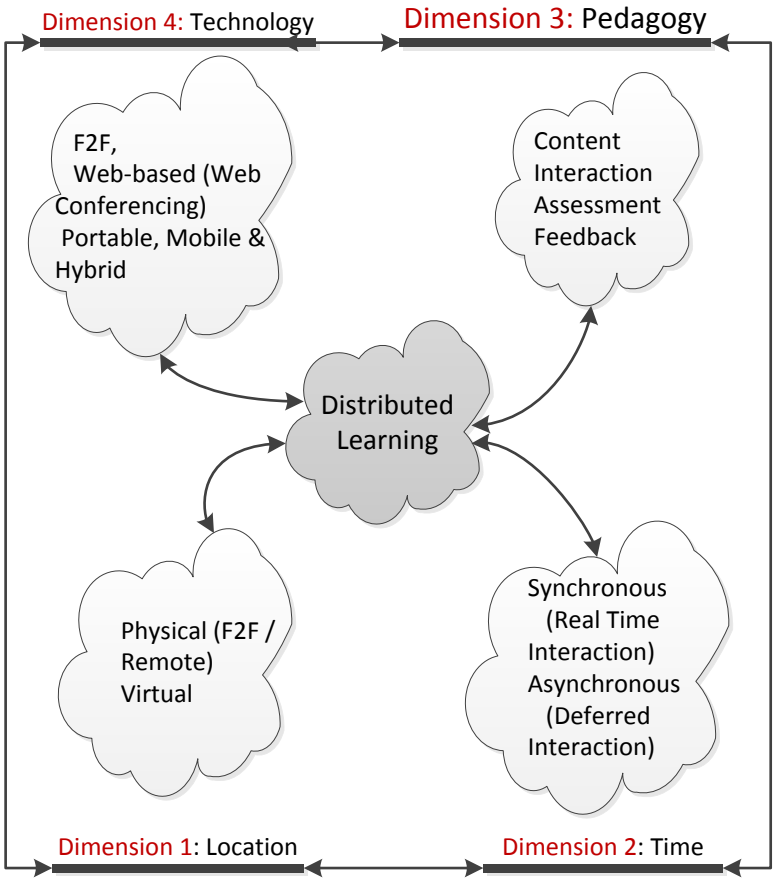

Figure 1. **Portrayal of dimensions in distributed learning taxonomy.**

With its underlying assumption that distributed learning can provide learning opportunities anytime/anywhere, this four-dimensional taxonomy encompasses a vast array of possible combinations and forms. To this end, the first dimension (lower left) distinguishes between the physical location (on-site or remote face-to-face) and the virtual location of the learning activity (Web-based, regardless of specific geographical location). As it expands classroom walls and bypasses traditional location constraints, the output of this dimension (i.e. flexibility in time and place of learning) is perceived to be the most important advantage of the technology-mediated delivery modes.

The second dimension (lower right) distinguishes between the synchronous (real-time) and asynchronous (deferred) time of the learning activity. Irrespective of the learner's geographical location, courses offered in synchronous mode allow real-time interaction between student and instructor, whereas courses offered in asynchronous mode allow only deferred interaction. Each type of interaction has both benefits and drawbacks. Much depends on the course design and the facilitator-to-student ratio. Typically, courses with larger enrollments tend to offer less supervised peer interaction, fewer collaboration opportunities, and limited interaction with instructors.

The third dimension (upper right) discerns the pedagogical repertoire associated with teaching and learning in terms of content presentation, learning activities, interaction, assessment, and feedback. The adoption of new emerging technologies (Web Conferencing, Blogs, Wikis, etc.) is

diversifying the pedagogical repertoire. By offering access to learning resources, interaction, and collaboration opportunities, these delivery modes are renewing or rejuvenating many traditional face-to-face pedagogical practices, while posing some technical, logistical, and pedagogical challenges to both faculty and students.

The fourth dimension (upper left) clarifies the various technologies (hardware and software) associated with various delivery modes (F2F, Web-based, portable and mobile devices, and hybrid). Since innovations to the technologies are ubiquitous and on-going, some delivery modes are likely to benefit from these technological innovations and will offer increased sophistication, particularly in their ability to facilitate remote access and participation and in their ability to encourage interaction, collaboration, and active participation. However, keeping up with ongoing innovations can be challenging and costly, hence the need for a DL multi-delivery mode strategy that integrates and justifies the academic value of these technologies.

So, even as this paper illustrates the assumptions and commonalities across various delivery modes, it reiterates that these variables are transversal. Their boundaries cross over each other, mirroring (to some extent) the dynamic world of teaching and learning – a world that is currently being reconfigured by the confluence of innovative technologies and pedagogies.

As it keeps these assumptions and dimensions in perspective, this paper attempts to organize various delivery technologies into five different delivery modes. More specifically, it uses technology (hardware and software) as a delineating variable to identify the following delivery modes: face-to-face, web-based, portable media, mobile devices, and hybrid. With the exception of face-to-face delivery (which can rely on some presentation technologies, e.g. projectors and/or PowerPoint), the delivery modes described herein are technology-driven and leverage computing, networking and wireless power. Additionally, even though most delivery modes use a course management system for logistics and for course content delivery, each delivery mode offers unique, non-redundant attributes that determine its placement within the matrix (Tables 1, 2, & 3).

To obtain a clear picture of the characteristics of each delivery mode category, this paper asks the following questions, inspired by traditional higher education teaching and learning practices:

- How is the learning facilitated?
- How is the content presented to the students?
- How are the learning activities facilitated?
- How are synchronous and asynchronous interaction among students and instructor facilitated?
- How is an assessment of student learning conducted?
- What are the hardware and software requirements?
- What are the potential benefits for students and faculty?
- What are the drawbacks for students and faculty?

The following matrix offers each delivery mode's answer to each of the questions and describes the pedagogical and technological benefits and the drawbacks of each delivery mode:

Table 1
Distributed learning taxonomy: Dimension 1 - Pedagogy.

Dimension 1: Pedagogy Course Activities	Options	Face-to-face	Web-based	Portable Media	Mobile Device	Hybrid
Learning is facilitated	face-to-face	✓				✓
	online, or via Web conferencing or two-way		✓		✓	✓
	via DVD-ROM			✓		
	via mobile devices				✓	✓
Content is presented using	live lectures	✓	✓		✓	✓
	archived streamed lectures		✓	✓	✓	✓
	audio and video clips	✓	✓	✓	✓	✓
	animations	✓	✓	✓	✓	✓
	simulations	✓	✓	✓	✓	✓
	demonstrations	✓	✓	✓	✓	✓
	tutorials	✓	✓	✓	✓	✓
	self-study		✓	✓	✓	✓
	case studies	✓	✓	✓	✓	✓
Learning activities are facilitated	face-to-face with optional supplemental online interactive activities	✓	✓		✓	✓
	in a small group	✓			✓	✓
	via individual and group presentations	✓			✓	✓
	using papers, reports, projects	✓	✓	✓	✓	✓
	using self-paced activities	✓	✓	✓	✓	✓
	using discussion forums	✓	✓	✓	✓	✓
	using self-assessments	✓	✓	✓	✓	✓

Dimension 1: Pedagogy Course Activities	Options	Face-to-face	Web-based	Portable Media	Mobile Device	Hybrid
Synchronous interaction is facilitated using	face-to-face interaction	✓			✓	✓
	online office hours	✓	✓	✓	✓	✓
	instant verbal and non-verbal feedback for both remote and face-to-face students	✓				
	text feedback in online meetings or chat	✓	✓	✓	✓	✓
Asynchronous interaction is facilitated using	email	✓	✓	✓	✓	✓
	threaded discussion	✓	✓	✓	✓	✓
	Blogs	✓	✓	✓	✓	✓
	Wikis	✓	✓	✓	✓	✓
	Various Web 2.0 applications, etc.	✓	✓	✓	✓	✓
	Web searches	✓	✓	✓	✓	✓
	Research reviews	✓	✓	✓	✓	✓
Assessment is conducted using	homework	✓	✓	✓	✓	✓
(Submitted mostly face-to-face or sometimes online)	papers, projects	✓	✓	✓	✓	✓
	quizzes, exams	✓	✓	✓	✓	✓
	labs, simulations	✓	✓		✓	✓
	case studies	✓	✓		✓	✓
	presentations	✓			✓	
	portfolios	✓	✓	✓	✓	✓

At the core of this first table is the idea that delivery mode has agency in both the teaching and learning processes:

From a logistical standpoint, some delivery modes (F2F and web-based) require heavy infrastructure investments, while others (portable media and mobile devices) might require a

more limited infrastructure. In this regard, a comprehensive institutional infrastructure, maintained by a strong support team, is required to enable a multi-delivery mode strategy.

Content presentation options are somewhat similar across all delivery modes. Face-to-face follows more traditional lecturing models and their concomitant formats of content presentation. In contrast, mobile devices pose some limitations, particularly the technical restrictions posed by the shortage of interface real estate. In addition, because of the rapid burgeoning of technology, more and more interface alternatives are likely to emerge (Kroeker, 2010).

Despite the logistical issues associated with some delivery modes (e.g. portable and mobile devices), self-paced and flexible access to courses is the hallmark of most delivery modes (which offer anytime/anywhere access to archives and content).

Interaction is at the heart of distributed learning. As noted by various researchers (Moore & Kearsley, 1996; Beauchamp & Kennewell, 2010; Bernard, Abrami, Borokhovski, Wade, Tamim, Surkes, & Bethel, 2009), interaction is distributed learning's cornerstone. All of the delivery modes provide a wide range of possibilities for interaction, and some of them offer unique features and attributes (ex. Web Conferencing). On one hand, synchronous interaction provides real-time interactivity, replicating the instant verbal and non-verbal feedback associated with face-to-face delivery. On the other hand, asynchronous interaction provides self-paced interaction opportunities conducive to larger participation and reflection, particularly with Web-based delivery modes (Chen, Wei, Wu, & Uden, 2009).

Assessment options are somewhat similar across the various delivery modes. In this regard, research has often raised proctoring, plagiarism, and authentication as the most common challenges confronted when using technology-mediated delivery modes; these issues are generally raised in relation to state legislation and accreditation. To resolve these issues, several technological alternatives are being offered. These ensure authentication, enable secure proctoring, and reduce plagiarism (Roberts, 2008). Recent evolutions in authentication (ex., iris authentication) and digital identity are likely to reduce some of these risks. However, it should be noted, here, that it is almost impossible to provide foolproof identity authentication, even in face-to-face assessment environments.

Table 2
Distributed learning taxonomy: Dimension 4 – Technology

Dimension 4: Technology Technology System Requirements	Options	Face-to-face	Web-based	Portable Media	Mobile Device	Hybrid
Student Hardware Requirements	Computer	✓	✓	✓	✓	✓
	High-bandwidth Internet connection	✓	✓	✓	✓	✓
	Camera		✓			✓
	Headset		✓	✓	✓	✓
	Microphone		✓	✓	✓	✓

Dimension 4: Technology Technology System Requirements	Options	Face-to-face	Web-based	Portable Media	Mobile Device	Hybrid
Student Software Requirements	Basic productivity software	✓	✓	✓	✓	✓
	Specialized software (as needed)	✓	✓	✓	✓	✓
	Various Internet browser plug-ins (e.g. Flash®, QuickTime®, Adobe Reader®)	✓	✓	✓		✓
	Whiteboard and desktop sharing applications (as needed)		✓	✓		✓
	Web 2.0 applications (as needed)	✓	✓	✓	✓	✓

Hardware requirements are similar across the various delivery modes. With the exception of those courses offered in a face-to-face format and, to some extent, those offered using mobile devices, a computer with a high bandwidth connection is required. The convergence of telecommunications and hardware technologies (amplified by an increase in computing power) is reshaping most of the delivery modes, particularly with the emergence of the mobile supercomputer as the next-generation cell phone (Woh, Mahlke, Mudge, & Chakrabarti, 2010). Similarly, with the exception of the face-to-face delivery mode, software requirements are almost identical across all of the delivery modes, reflecting the predominance of certain plug-ins such as Flash and QuickTime. However, the emergence of new technology standards (including HTML5, WebM, XForms, XUL, and Silverlight) is likely to reshape the software requirements for delivery modes, including the traditional need for audio/video decoding plugins such as QuickTime and Flash.

Table 3
Distributed learning taxonomy: Benefits and Drawbacks

Benefits and Drawbacks	Options	Face-to-face	Web-based	Portable Media	Mobile Device	Hybrid
Potential Benefits for Students	Flexibility, convenience, programs offered worldwide		✓	✓	✓	✓
	Ease and self-paced access	✓	✓	✓	✓	✓
	Discussion and reflection on ideas	✓	✓		✓	✓
	Timeliness of instructor feedback during class	✓	✓	✓	✓	✓

Benefits and Drawbacks	Options	Face-to-face	Web-based	Portable Media	Mobile Device	Hybrid
	Face-to-face interaction / collaboration with peers during class meetings	✓				✓
	Online interaction / collaboration with peers during class meetings (Learning Management System)		✓			✓
	Multiple options for face-to-face interaction	✓	✓			✓
	Timely feedback on automated tests (Learning Management System)	✓	✓	✓	✓	✓
	Interpersonal experience and interaction with peers	✓	✓		✓	✓
	On-campus experience (extra-curricular activities)	✓				✓
	Availability of lecture archives for revision and exam preparation		✓	✓	✓	✓
Potential Drawbacks for Students	Class activities limited to in-class time	✓				
	Rigidity of scheduled time and attendance policies	✓				✓
	Geographical isolation		✓	✓	✓	✓
	Reduced access to support services and resources (administrative, advising, technical, etc.)		✓	✓	✓	✓
	Logistics of proctoring		✓	✓	✓	✓
	Delay or lag when attending synchronous session		✓			✓
	Delayed instructor feedback (exception: instant feedback during synchronous online meetings)		✓	✓	✓	✓
	Lack of visual and social cues from students		✓	✓	✓	
	Potential for lack of student motivation, commitment, and time	✓	✓	✓	✓	✓
	Potential for misunderstanding directions for assignments	✓	✓	✓	✓	✓
	Potential end-user technical difficulties		✓	✓	✓	✓
	Potential for being overwhelmed by the amount of information available all at once		✓	✓	✓	

Benefits and Drawbacks	Options	Face-to-face	Web-based	Portable Media	Mobile Device	Hybrid
Potential Benefits for Faculty	Classroom dynamic (interpersonal interaction and engagement)	✓			✓	✓
	Flexibility of time, location, and pace		✓	✓	✓	✓
	Flexible planning		✓	✓	✓	✓
	Ease of course updates, resulting in greater organization and development of content		✓	✓	✓	✓
	Long-tested pedagogical practices	✓				✓
	Synchronous interaction	✓			✓	✓
	Availability of lecture archives for potential reuse		✓	✓	✓	✓
	Availability of lecture archives for self- or external review and assessment		✓	✓	✓	✓
Potential Drawbacks for Faculty	Rigidity of schedule, high volume and frequency of communication and contact	✓	✓		✓	
	Technical requirements		✓	✓	✓	✓
	Copyright issues	✓	✓	✓	✓	✓
	Intellectual property of course content	✓	✓	✓	✓	✓
	Integrating delayed student interaction during synchronous class meetings					✓
	Need to learn to teach and to manage various synchronous and asynchronous communications tools		✓	✓	✓	✓
	Logistics of interaction and communication between student and instructor as well as between student and student		✓	✓	✓	✓
	Balancing live synchronous sessions with asynchronous sessions		✓	✓	✓	✓

The consensus emerging from research is that flexibility and convenience are the key benefits ascribed to each of the technology-driven delivery modes. Indeed, self-paced and flexible access to content, a wealth of interaction and collaboration opportunities, and an advancement of scholarship of teaching are reported to be among the benefits (Larreamendy-Joerns & Leinhardt, 2006; Means, et al., 2009; Castle & McGuire, 2010). In contrast, isolation, lack of immediate feedback, and lack of interpersonal interaction and experience (particularly lack of campus-life experience) are cited among the drawbacks of technology-driven delivery modes (Tallent-Runnels et al., 2006). However, many have argued that the benefits of distributed learning outweigh its drawbacks (Carr-Chellman & Duchastel, 2000; Chen, Lambert, & Guidry, 2010).

Delivery mode commonalities

To complete this taxonomy and to clarify this paper's earlier point about the existence of overlap and shared features among various delivery modes, it should be noted that most of the delivery modes share the following characteristics:

Audience: With the exception of the face-to-face mode, which tends to target traditional students (residential, local and commuter), technology-mediated delivery modes target non-traditional, working adult learners worldwide. This distinction is blurring progressively as local students are opting for the flexibility associated with web-based courses.

Attendance: Because of on-campus policies, face-to-face courses require attendance; for the rest of the delivery modes, course attendance can be left to the discretion of the instructor. In contrast to the face-to-face "seat time" concept, the attendance requirement in some distance courses is being progressively reconsidered, particularly since it is perceived as an inhibitor to the flexibility associated with technology-mediated delivery modes (although attendance may remain critically important for required practica and/or for accreditation requirements).

Support for development: With the exception of face-to-face courses, all of the remaining delivery modes require extensive support for course design, production, and facilitation. Additional support is also needed for technology integration and for in-classroom operational and technical assistance. Especially because of the potential increase in faculty workload and efforts during course development and delivery, the offering of an ongoing program of faculty support and training (covering pedagogical, facilitation, and technical skills) becomes one of the cornerstones of a successful DL strategy.

Faculty profile: With the exception of a technical literacy ability rating that is slightly lower for face-to-face instructors, all of the various delivery modes require a knowledgeable, enthusiastic, engaging, caring, motivating instructor who creates a positive classroom climate; is aware of the myriad student learning styles, constraints and interests; is information-technology literate; and is visually literate.

Student profile: Most of the delivery modes require students to be self-motivated, info-tech literate, organized, disciplined, curious, engaged, and excited about learning.

Conclusion and recommendations

In summary, the taxonomy proposed in this paper provides a useful tool which should lead to a deeper understanding of features and requirements of various delivery modes. The author argues that this type of understanding provides a critical decision-making tool for policy-makers, administrators, practitioners, and faculty, particularly as they aim to use these delivery modes to expand access, to improve learning outcomes, and to transform the teaching and learning landscape.

However, it must be noted that this taxonomy is contextualized within a dynamic and complex cultural and informational system that ultimately shapes its effectiveness. The many benefits of the various delivery modes can easily be undone if they are implemented without a clear roadmap for their integration and use. With this caution in mind, the author reemphasizes that, for the effective integration of various delivery modes, a holistic perspective which articulates all of the institutional, technical, pedagogical, and logistical considerations related to distributed learning must be used. The proposed taxonomy is likely to fuel the thinking of educators at institutes of higher education who are interested in integrating and implementing more technology-driven delivery modes for their courses. Consequently, the author offers several key suggestions designed to advance the most effective understanding and use of this proposed taxonomy:

Conduct a thorough assessment of institutional readiness in order to understand the state of the current technical, logistical, and personnel capacity, including: 1) infrastructure capability (ex. network, bandwidth, storage, servers); 2) personnel (faculty, technical, academic and non-academic staff); and 3) organizational processes (ex. institutional and individual barriers, procedures, and workflow, from registration to course evaluation).

Craft an institutional strategy to outline the institution's distributed learning vision, strategy, and action agenda.

Develop a blueprint document which is aligned with the institutional environment and the strategic plan and which is strongly endorsed by leadership, faculty, and students. This document should clarify, among other things, the funding and the revenue distribution model (including incentives and support to both academic units and faculty for course development).

Establish partnership and articulation agreements with other institutions in order to leverage and share resources and expertise.

Update existing policies and practices to reflect the dynamic and evolving nature of the distance learning environment (considering intellectual property and copyright issues; workload, incentives, and reward structure; program/course design, approval, and revision; quality standards; and accreditation).

Rethink, renew and perhaps even change existing well-entrenched administrative and pedagogical practices. Explore open educational resources as viable alternatives to traditional textbooks.

Provide support (preferably a centralized support unit) to faculty during course design, development, offerings, and revision. Provide access to easy-to-use and well-designed course design templates and a repository of sample online courses and course activities. This is critical to the comfort and capability of faculty members transitioning and developing online courses.

Establish/adapt a Quality Framework (a standard rubric) that applies well-documented course production standards and ensures consistency across degree programs (and possibly unseats some faculty beliefs that online courses are inherently inferior to face-to-face courses).

Provide learners with one-stop-shop support services, including both academic (tutoring, advising, library access, technical help) and non-academic (administrative, financial aid, counseling) services.

Establish a systematic process for longitudinal data collection, particularly in assessing students' performance and satisfaction and faculty satisfaction across the various delivery modes.

Establish a research and development group to track and integrate emerging technologies, while continuing to engage faculty and students in the effective use and integration of these technologies.

As he offers these recommendations, the author reiterates his belief that the effective use and combination of various technology-mediated delivery modes will help institutions of higher education to expand educational opportunities to all learners. It will also help those institutions to harness the power of technology, increase learner motivation and engagement, and enhance the provision of quality learning. However, in order to transcend the more mechanistic view of education (which focuses on the delivery of content), there is a continuing need for yet more systematic research to understand the ways in which various delivery modes shape the cognitive, affective, and social learning experiences of students as they benefit from technology-driven learning.

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