WELCOME TO MY E-LEARNING GROUP: THE EFFICACY OF ONLINE SCAFFOLDING

Romiro G. Bautista, Ph.D. International University, Kingdom of Bahrain

ABSTRACT

This study investigated the learning impact of online scaffolding in sustaining a community of inquiry in physics instruction. Online learning segments were included in the process of developing classroom tasks vis-à-vis with the course intended learning outcomes in a collegial, constructive, and democratic learning environment through online scaffolding techniques. Two sections of 34 students enrolled in University Physics 1 were used in this study. A questionnaire was adopted in determining the perceived relative magnitude of advantages of the online discussion. Employing the Quasi-Experimental Research design, the following are concluded: respondents were social butterflies although they are bounded with cultural restrictions in using online communication tools; respondents were satisfied on the embedded learning segments in the course and found them beneficial to their learning; and online learning model accounts a high impact to the learning performances of the respondents.

KEY-WORDS: A-priori e-learning experiences, Asynchronous and synchronous e-learning modality, Community of inquiry, e-group, online scaffolding, Reciprocal determinism and causation.

1. INTRODUCTION

The advent of advanced educational technologies is a vast array of digital resources and content in learning that offers the magnanimity of theories towards educational opportunities (Dillenbourg, 2000; Bautista, 2013). This offers practices in sustaining a community of inquiry in a dynamic classroom. Sustaining a community of inquiry in any educative instruction requires greater options for quantity and quality of learning interactions in a collegial learning environment. This offers student-learners the opportunity to interact with each other at anytime and anywhere through online discussion tools and facilities. One of the approaches in the sustenance of this community of inquiry is the implementation of online scaffolding in classroom instruction (Swan, 2003; Anderson, 2006).

Online learning happens in a community of inquiry in a self-regulated constructive learning environment. Learners interact with other participants in varied learning modalities of synchronous and asynchronous activities; hence, a rich learning environment (Anderson, 2004). This environment allows cooperative attainment of the learning contents' objectives and the development of personal relationship among the student-learner participants (Ryan-Rojas, 2012).

Mediated with online scaffolding of instructional delivery, the teacher and learners work together to optimize learning experiences, (Bautista, 2013; Anderson, 2004; Ryan-Rojas, 2012). This provides realistic yet practical opportunities in attaining sustainability in the teaching-learning process through independent and constructive learning. This is necessary as the nature and purposes of physics instruction needs reinforcement for it had been mystified as difficult since time immemorial. Aptly, most students hold negative stereotype images of science and technology in general and physics in particular.

Researches on the introduction of online scaffolding and segments of instructional techniques had been prevalent over the decade and yielded positive findings: an enriching leap towards harnessing communication abilities among student-learners, open and free discussion boards through various modalities of inquiry, and deconstruction process that harmonize theories of interaction and discourses in teaching-and-learning (Bautista, 2013). These researches had established positive impact on the academic performance and achievement of the student learners towards learning outcomes (Bautista, 2013; Anderson, 2004; Bautista, 2012). The crux is: science instruction needs to be reenergized by providing challenging units of continued inquiry among its students-learners through online infrastructure– the creation of intuitive learning that engages student-learners from the spark of excitement that stems from discovery. This engagement results in more learning as they develop more integrated, useful understanding of concepts and their interrelationships, and applicability (Bautista, 2013; Bautista, 2012).

2. MATERIALS AND METHODS

The Quasi-Experimental Design was used in this study. The results provided bases in the establishment of the relationship between the independent variables and dependent variables of the study. It elucidated on the impact of the embedded online instructional segment to the students' success in achieving select course intended learning outcomes through modalities of online scaffolding. The online instructional segments used in this study were LMS, online mentoring, chat room, bulletin group discussion, and e-mail exchange; all were done in the e-learning facility of the university, together with the personal e-mail and FB group of the author-researcher.

This study was conducted at the Natural Science Department of the Center for General Education of AMA International University – Bahrain during the second trimester, SY 2012 – 2013, where the author was previously employed as University Professor. The respondents of this study were the two sections of NATSC1D (University Physics 1) handled by the author. The frequency count, mean, Pearson-r correlation, and ANCOVA were used in the treatment of the gathered data to conclude on the stated problems of the study.

A questionnaire formulated by Anderson and Elloumi was adopted to determine the learning impact of the embedded online segments and experiences through online platforms to the learning experiences of students (Anderson, 2004). Students' academic performance towards the course was determined by their performance in one of the major examinations (Midterm Examination). The test instrument was formulated based on a two-way Table of Specification and assessed through the internal moderation used by the university. The instrument was validated by the course Coordinator, together with other teachers teaching the subject, and The department head of Natural Sciences.

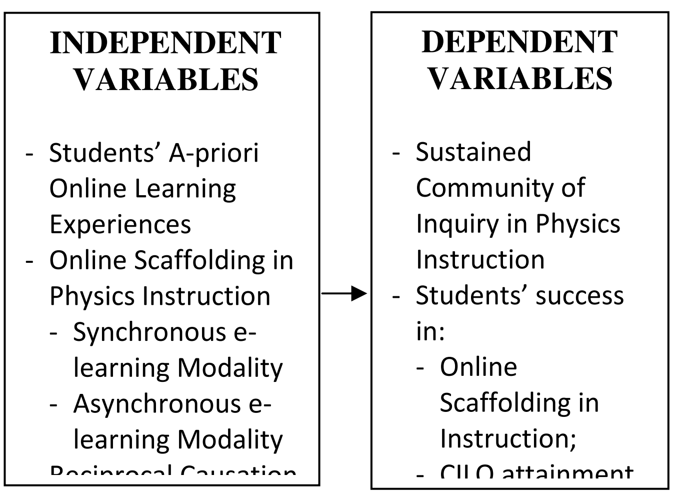

Figure 1 Research Paradigm

Figure 1 presents the variables expected to sustain a community of inquiry in physics instruction. It includes the students' a-priori online learning experiences, the reciprocal causation of the learning environment, and the e-learning modalities implemented in the instructional design of the class program – synchronous and asynchronous. The students' a-priori experiences in online platforms are believed to be their encapsulating schema towards their success in the select online classwork. Reciprocal causation was employed to qualify interaction between and among the actors and actresses of the classroom instruction – the teacher and the learner. It employed the reciprocal determinism theory relative to the analysis of the effects of online scaffolding in classroom interaction. The modalities of classroom instruction offered in a constructive learning environment were synchronous and asynchronous. The Social Learning Theory of Bandura (1986), together with Social Development (Vygotsky, 1978) and Situated Learning (Lave, 1988). Theories, was the recuperating basis in regulating the pace of the instructional design of the class program. These leaps are expected to reshape the physics instruction in the sustenance of the classroom's community of inquiry.

3. RESULTS AND DISCUSSION

Table1 presents the a-priori learning experiences of the student-learners in synchronous and asynchronous online learning activities. As gleaned on the table, the respondents are exposed to online platforms and other social networking sites with a composite mean of 3.64 and interpreted as *often*. However, it can be noted that the students *seldom* (*mean* = 3.32) use social and communications tools, like online dating, friends reunited, among others, due to the respondents' cultural endowment and restrictions. In an interview, many of them are using the virtual world too often like online tutorial, webinar, wikis, and educational social networks. In fact, many of them were maintaining their own blogs. Moreover, the respondents are using sophisticated mobiles that could offer online platforms at their fingertips. Respondents were generally satisfied in using OLC chiefly on revisiting prior discussion threads. Apparently, the average ability respondents benefited most in using OLC when compared with their counterparts as exemplified by their group mean response. In an interview with the respondents, they claimed that they found an avenue where they can freely participate in class discussion particularly the women respondents. It can be noted, however, that women in the Arab countries are most likely passive when mixed with their men counterparts due to their cultural endowment and restrictions. Through this avenue, women can now participate in the discussion.

TABLE 1 THE A-PRIORI LEARNING EXPERIENCES OF THE RESPONDENTS IN ONLINE COMMUNITIES

		Mean	Descriptive Interpretation
1	I am a social butterfly and use social networks (E.g. Facebook, Instagram, Twitter, MySpace, Flicker, among others)	3.79	Often
2	I use synchronous chat tools (E.g. chat rooms, Instant messaging, IP telephony, among others)	3.56	Often
3	I use messaging and discussion tools (E.g. Email, forums, phone texting like BBM, Tango)	3.88	Often
4	I play online games or use virtual worlds and talk to other players (E.g. Clash of Clans, World of War Craft, Battlefront 2, Sims Online, Second Life)	3.71	Often
5	I have an online personal space other than a social network (E.g. Academia, Research Gate, Web pages, blogs, triond team, among others)	3.56	Often
6	I use other social and communication tools online (E.g. Viber, Skype, Tango, YM, Badoo, WeChat, Online dating, Friends Reunited, among others)	3.32	Seldom
Average		3.64	Often

TABLE 2 RESPONDENTS' SATISFACTION IN USING SELECT ONLINE LEARNING COMMUNITIES IN CLASSROOM LEARNING WHEN GROUPED ACCORDING TO LEARNING ABILITY[1]

		High Ability		Average Ability		Low Ability	
		Mean	DI	Mean	DI	Mean	DI
1	I am free to participate in the discussion more frequently than traditional courses.	3.33 abc	MS	3.80 *ab	S	3.00*ac	MS

2	It enables me to take more researches than the traditional classroom routine.	4.00 *ac	S	4.80 *b	VS	3.80*ac	S
3	It develops my critical thinking abilities more than the traditional classroom routine.	4.00 *ac	S	4.80 *b	VS	3.80*ac	S
4	Rereading previous discussion threads enables me to review and understand topics or questions and answers that I didn't understand well.	4.67 *ab	VS	4.80 *ab	VS	3.80*c	S
5	I am satisfied on the use of online learning communities.	4.00 *ab	S	4.60 *ab	VS	3.00*c	MS
Average		4.00 *a	S	4.56 *b	VS	3.48*c	MS

Legend: DI – Descriptive Interpretation; MS – Moderately Satisfied; S – Satisfied; VS – Very satisfied
1 means of the same letters within rows are comparable at 0.05level of significance
* - mean difference is significant at 0.05level of significance (LSD test)

Concomitantly, respondents in the low ability group found a moderate satisfaction to the online segments as they found difficulty in coping with the pace of the online learning activities. One of the problems raised was the use of the English language. It is known for a fact that English is still new to the Arabic curriculum. In fact, majority of the low ability group were graduates of the Arabic curriculum. This means that their secondary curriculum was purely Arabic. Hence, students are zero-to-beginner English speakers. As stipulated by Anderson and Elloumi (2004), the respondents' ability to express themselves through their linguistics competences play a significant role in their success in participating online learning. When mitigated, online learners will soon find synergy in the online sequences that will pave for more success towards independent learning: creativity through association, drill and exercises, behaviors through simulation, feedback and practice, sound judgment from received feedbacks, and coaching among their peers, analysis, deconstruction, and practice to both synchronous and asynchronous learning activities (Bautista, 2013; Ryan-Rojas, 2012; Bautista, 2012; Ebner, 2010; Aguado, 2012).

TABLE 3 BENEFITS OF USING SELECT ONLINE LEARNING COMMUNITIES IN CLASSROOM LEARNING WHEN GROUPED ACCORDING TO LEARNING ABILITY[1]

		High Ability		Average Ability		Low Ability	
		Mean	DI	Mean	DI	Mean	DI
1	I am free to participate in the discussion more frequently than traditional courses.	3.67 abc	B	4.60 *ab	VB	3.20 *ac	MB
2	It enables me to take more researches than the traditional classroom routine.	4.17 *ac	B	4.80 *b	VB	3.80 *ac	B
3	It develops my critical thinking abilities more than the	4.17	B	4.80	VB	4.00	B

	traditional classroom routine.	*ac		*b		*ac	
4	Rereading previous discussion threads enables me to review and understand topics or questions and answers that I didn't understand well.	5.00 *ab	VB	4.80 *ab	VB	4.20 *c	B
5	It enables me to ask questions immediately when things seems difficult to understand.	3.83 *ac	B	4.80 *b	VB	3.40 *ac	MB
Average		4.17 *ac	B	4.76 *b	VB	3.72*ac	B

Legend: DI – Descriptive Interpretation; MB – Moderately Beneficial; B - Beneficial; VB – Very Beneficial, [1]means of the same letters within rows are comparable at .05 level of significance* - mean difference is significant at .05 level of significance (LSD test)

Online learning offers an array of educational benefits: association to simulation, coaching and feedback, and deconstruction and practice towards demonstrable academic success and performance. Conducted in a collegial, constructive, and democratic learning environment through online scaffolding techniques, students come in a practice of inquiry in the sustenance of learning. As explicated by Bandura (Laverty, 2012) in his Social Learning Theory, learning cognition, which is based on cognitive processes, transforms the individual through imitation, modeling, and feedback consists of environmental, individual, and other social stimulus that are believed to reshape the learning environment of the student-learner. On the other hand, the interaction models of online learning of Anderson and Elloumi(2004) and the time and place dimensions of online delivery systems of Duderstadt (1997); in Dillenbourg(2000) can be posited as bases of this cognition process where learning takes place in a community of inquiry. Knowing that learners learn in varied modalities of creativity, deconstruction, and sound judgment to feedback on the threads of discussions during online scaffolding sustains a community of inquiry among students (Bandura, 1986; Lave, 1988). Hence, learning is enforced as continuous research and investigation are to be done.

TABLE 4 T-TEST ON THE GROUP GAIN SCORES OF THE RESPONDENTS IN PHYSICS

	t-test for Equality of Means		
	t	Sig. (2-tailed)	Mean Difference
Gain Score	2.588	.015*	2.8056

Legend: *-significant at .05level of significance

The table presents the comparative analysis on the group mean scores of the respondents. It can be noted that t-test results at .05level of significance reveal that there is incomparable group mean-scores between the experimental group and the control group (t-value of 2.588, and p-value of .015). The mean difference of 2.806 between the two groups of respondents is a great margin. This means that the null hypothesis of no significant difference between the group mean scores of the experimental and control group is hereby rejected. The foregoing results validate the results of prior studies conducted along this line when they claimed that online scaffolding is a significant factor in establishing a community of practice and inquiry that redirects classroom routine and impacts the learning performances of the online-learners., (Bautista, 2013; Anderson, 2006; Bautista, 2012; Ebner, 2010; Aguado, 2012).

Table 5 presents the learning impact of the embedded online segments to the academic performance of the respondents. It can be noted that the impact of the models of online scaffolding is high considering that the coefficient of determination indicated by the adjusted R-squared is 94.6 % which means that the models of teaching account for 94.6% of the variability in the academic achievement of the students. Moreover the impact of the online learning model accounts 78.8% to the learning abilities of the respondents across their respective classes.

TABLE 5 TESTS OF BETWEEN-SUBJECTS EFFECTS ON THE RESPONDENTS' ACADEMIC PERFORMANCE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Observed Power[e]
Intercept	233.304	1	233.304	22.573	.012	.914
Pretest	73.097	1	73.097	13.699	.001	.946
Learning ability * class	55.985	2	27.993	5.246	.012	.788

Table 5 likewise presents the interaction between the learning abilities of the students and the method (online learning method). It presents the impact of the treatment conditions to the academic achievement of the students across the learning abilities of the students in the two groups as shown in Figure 2. Figure 2 presents the relationship of the estimated marginal means of the post-test results and the learning abilities of the students, categorized as low, average, and high. The result of the post-test mean score is evaluated with the pre-test covariate value of 9.736. It presents that the highly able students benefited the most in the program followed by the averagely able students.

The results of the study indicate that students who were exposed to the online learning model obtained a significantly higher mean post-test score on their academic achievement than the students who were exposed to the customary teaching models and techniques. This result supports the claims Anderson and Elloumi (2004); and Aguado, Barrutia, and Echebarria (2012) who reported that students in the collaborative learning group posted better scores on the critical thinking test than students who studied individually. Various proponents of reciprocal causation through online scaffolding, collaborative instruction, and constructivism claimed that the active exchange of ideas in online discussion not only increases interest among the members of the group but also promotes critical thinking and academic achievement. As cited by Swan (2003; Anderson, 2006; and Bautista 2013; Bautista, 2012), there is convincing evidence that cooperative teams achieve higher levels of thought and retain information longer than students who work only as individuals. The shared learning during online sessions, whether it is synchronous or asynchronous, gives students an opportunity to engage in discussion, take responsibility for their own learning, and thus become critical thinkers (Dillenbourg, 2000; Swan, 2003; Anderson, 2004; Laverty, 2012). Online discussion also engenders further thinking since students are engaged in activity, reflection, and conversation where the learners become responsible for defending, proving, justifying, and communicating their ideas to the other members of the group (Bautista, 2013; Anderson, 2004; Bautista, 2012; Aguado, 2012).

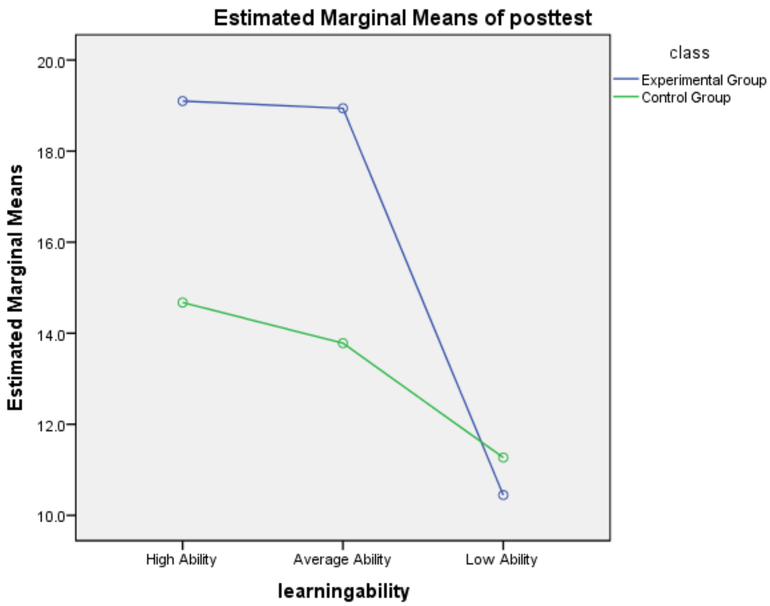

Fig. 2 Interaction Model of the Respondents' Academic Performance in terms of their Learning Ability

(Covariates appearing in the model are evaluated at the following values: pretest = 9.735; Corrected model is highly significant at .05level; R-squared of the pretest and posttest = .946; R-squared on the interaction of the OLM to the learning ability of the respondent vis-à-vis with their class = .788).

4. IMPLICATION TO THEORY AND PRACTICE

Pursuing the intended scientific disposition requires initiation and mediation, e.g. online scaffolding, in a reconstructed environment of acquisition processes among students. Passive learners deserve special attention in this respect because they should be assisted to develop more active learning strategies. To this end, an approach that can truly be effective in terms of developing critical thinking skills and academic achievement among students is to employ strategies of teaching that are compatible with an active-constructive learning environment. There is therefore a need for all Higher Education Institutions (HEI's) to expose students to various approaches in teaching concepts and principles in physics whether synchronous or asynchronous. This is urgent since one of the philosophies of the World Declaration on Higher Education states that "the ideal teacher is not authoritarian but a trustworthy facilitator of the learning processes, who enables the learners to become active constructors of meaning and not passive recipients of information." Thus, insofar as the objective of raising the quality of physics achievement among students is concerned, the radical change of engendering online infrastructures in classroom teaching should therefore be at the helm of all the HEI's.

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