

AC 2007-254: EVALUATING THE EFFECTIVENESS OF E-LEARNING IN A UNIVERSITY

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Evaluating the effectiveness of e-learning

Abstract

Computer assisted instruction and assessment is increasingly being adopted within the university sector to complement more traditional methods of teaching and learning. Much focus is often given to the advantages of exploiting technology, and the ability to store, manipulate and report data. However, teachers and trainers are increasingly aware that students and learners are beginning express concern about the time and effort required to achieve learning outcomes. This paper reviews these concerns, and presents the results of an attitudinal survey among a group of 143 engineering students that reveals their misgivings. Kendall's rank correlation was used to analyse the results. The paper continues by showing that through careful planning, design and implementation of on-line course success is possible, thus enabling full advantage of the benefits of available technologies to accrue. The paper concludes by arguing that learner feedback is essential when evaluating on-line instruction.

Keywords: e-learning, web-based courses

Introduction

What is e-learning? There are a lot of complex definitions of e-learning in the academia. The simplest one may be: "*e-learning is the use of Internet and digital technologies to provide educational experiences to our fellow students*". This definition is open-ended, allowing complete freedom as to how these experiences are formulated, organized, created, packaged, and marketed. Digital technologies include Web-pages, interactive displays, video, e-mail, and others. The traditional view of education is in the classrooms of universities and workplaces. However, change does happen rapidly in classrooms. Not only does learning look different during the new era, but teachers are also

using new technologies to deliver teaching in the classrooms. A completely new view is held of what it is meant by learning and how it takes place.

Is e-learning different from traditional teaching and learning?

In e-learning, it is the learner, not the facilitator, who controls the learning pace and order of learning experiences, and to a certain extent, the selection of which experiences are a part of the course. Each learner may experience different learning outcomes through the same curriculum. E-learning can take place when and where learners want it to, making it easier to integrate learning with a definite procedure. However, e-learning is never more than a mouse click from engaging or quitting. They can start or drop out at any moment. Web designers can never take the motivation of the learners for granted. In e-learning, learners are not physically present in the classrooms. It is hard to know their responses, emotion, and progress. There is no facial expressions and body language. Nor can we listen to the tone of voice or gestures of the learners.

Common misunderstandings

Converting handouts or slide presentations to web materials are not e-learning. Web viewable format creates another form of pseudo-e-learning ^[1]. Most teachers think of units of learning as formal and conventional courses. It should be well defined, written curriculum and all instructions conducted as a scheduled sequence of events. E-learning may follow in the same way, but not all e-learning must follow. It can also embrace other forms of learning, such as electronic job aids, computer simulations or animation, games, virtual tour, conversations with people coming from another corner of the world and so on. Nevertheless, it is not computers teaching students. Although computers and programme are parts of e-learning, they are the medium and tools, not the genesis of learning. E-learning does not eliminate teachers, but it re-defines teachers' role. Teachers are responsible for

triggering students' learning.

If there is no fixed form or locations, what will e-learning work for students? In traditional classroom, teachers are the instructors, who teach. In e-learning environment, they are the designers, who teach fellow students how to learn. In the other words, teach them 'learning to learn'.

Methodology

The overall aim of the evaluation was to assess the alignment of students' expectations and the level of satisfaction achieved by the e-learning activities. It also highlights the nature of its goodness and barriers, and from these, to draw up some recommendations for the further implementations. The evaluation did not seek for a measure of the performance of the various materials, but to examine students' expectations, coherence of the subject, attitudes towards e-learning and their experiences. Data were collected from 43 questionnaires. All of them have experiences of using e-learning.

The evaluation study was based on a questionnaire developed by the authors. Students were asked to express their expectations (importance of the element) and actual rating of the items. To begin with, a preliminary explanation was given. The authors explained the purposes and how to complete the questionnaire. Moreover, a general description about the aims of the survey and how the data collected would be eventually used was given. Participants were guaranteed that all data would be reported anonymously. The rating was based on 6 points Likert Scale (1 being the least important or least satisfied to 6 being the most important or most satisfied) ^[2]. Every part was formed by 43 ratings and an average rating was derived. The ratings were then correlated by Kendall's Taub to test the association ^[2]. The outcome is whether their importance is truly reflected in the learning process or not. There are three sections in the questionnaire. The first part A (A1 to A9) was

devoted to design of the Web, provision of software and hardware, and logistic arrangement. The second part B (B1 to B9) was a delineation of the subject management and communication channels. The last part C (C1 to C9) was about the instructional design of the subject. Students were asked to give an overall rating (A10, B10, C10) of each part. It aims at providing a comparison to the averaged ratings of each part. The overall ratings were checked against averages derived from each part.

The correlation between the expectations (level of importance) and level of satisfaction was studied by rank correlation by replacing the results with their ranks. Ties were assigned the average for the ranks associated with the tied observations. The correlations between the ranks were indicated by the Spearman rank correlation r_s [2]:

$$r_s = 1 - \frac{6 \sum d_i^2}{n^3 - n} \quad \dots (1)$$

Where, d_i is the difference between the level of importance and level of satisfaction ranks.

The correlation is good when the number of ties is small in comparison to n .

The rank correlation in the group with i^{th} , $i+1^{\text{th}}$, ... n^{th} student can also be indicated by the Kendall's rank correlation coefficient:

$$r_k = \frac{\kappa}{n(n-1)/2} \quad \dots (2)$$

Where, κ is the sum of $n(n-1)/2$ counts for,

$$\kappa = \sum_i \zeta_i \quad \dots (3)$$

$$\zeta_i = \begin{cases} 1 & ; \lambda > 0 \\ 0 & ; \lambda = 0 \\ -1 & ; \lambda < 0 \end{cases} \quad \dots (4)$$

$$\lambda = (\phi_{1,i+1} - \phi_{1,i})(\phi_{2,i+1} - \phi_{2,i}) \quad \dots (5)$$

Where, ϕ_1 and ϕ_2 are the importance factor and the level of satisfaction factor

respectively.

Results

Table 1 shows the distributions of the assessment results of individual categories. The rank correlation coefficients derived from the Spearman and Kendall ranking are shown in Table 2. It shows the calculated results of “overall satisfaction of hardware setup”, “overall satisfaction of materials at the web” and “overall satisfaction of instructional design” with the students’ satisfaction level. The rank correlation coefficient r_s and r_k for all categories was determined and correlated to the level of satisfaction for all sample students ($r_s = -0.462$ to 0.527 ; $r_k = -0.328$ to 0.423 ; $P > 0.001$). The results explicitly indicated that the performance of e-learning was not aligned with students’ expectations. Negative correlations were found for most of categories (categories A & C). It was found that the level of satisfaction of students is not a monotonically increasing function of the e-learning.

It was also observed that the assessment by “overall satisfaction of materials at the web” associated with the highest correlation coefficients in all sample categories and the “overall satisfaction of hardware set up” having the lowest correlation coefficients. Apart from the satisfaction of the materials at the web, it is not entirely satisfied as an e-learning.

Discussions

The computer access to universities network from home and campus was possible in most homes in Hong Kong. Students had expressed that most hits were actually only the retrieval of course materials and handouts rather than interactive discussion or other learning activities. Results also indicated that a large portion of students accessed the web at some times, usually at home. The level of importance was close to five out of six. Despite the low ratings of facilitators’ involvement, there was nevertheless a negative correlation

between students who successful logged-in the course and the extent of their on-line discussion. A major issue concerned the question of which format to use. Not surprisingly, students prefer to save web pages or print them off to read later. Printability became another important factor in web design. Students have different browsers and versions at home. Word was considered the most universally used format, and portable document format (PDF) files are also widely accepted because of its transferability across different operating systems. But word-processed documents converted into PDF often looked messy with poor spacing and offset formatting. This problem is obvious when equations are used in the document. The speed of uploading materials is also a serious concern. Students rated the connecting speed and uploading materials as the first priority. Both of the reasons lead to the same feedback – loss of patience and frustration. With reference to the instruction design, most students did not express high satisfaction. It is also the lowest one among three categories, but students rated it as the most important one. It clearly indicates that there is a mismatch of expectations and actual performance.

Conclusions

The experiences outlined in this survey demonstrate the way in which the design and implementation of a web based subject. Rather than assuming a smooth process of learning towards a perfect outcome, what this survey illustrating is that certain key elements can motivate or de-motivate students' learning affinity. The overall impression from the statistical analysis of the evaluation was that students find the web very important to their learning, but its performance was far below their expectations. Students were highly disappointed with the instructional design. Facilitators did not get involved as much as they expected. There is no universal guideline of involvement for facilitators. It solely depends on the compromise between the two parties. In line with the fact that students expressed a degree of satisfaction with the materials provided online (Category B). Key to success of

e-learning is a wide array of different aspects. The challenges that were addressed included learning flexibility, support services, interactive activities and coherence of classroom activities. Hardware and software setup also plays a crucial role in order to have a smooth connection to the web. Close follow up and support during the start-up phase concerning how to get started and settings at home is necessary. Dedicated technical support would clearly have made a huge difference to the smooth running of the e-learning and the benefits accrued from its exploitation.

Online discussions among students have some advantages over face-to face contact. Asynchronous meetings eliminate barriers of physical locations and time. Participation can occur anytime and anywhere. Introduction to online learning should also be provided, specifically for students at elementary level. They have less self learning experience. Tutors / facilitators involvement is so far, the most crucial factor. It refers to the design of pedagogy of the subject. The content and the ability of students to either absorb world wide information or knowledge within the curriculum falls on the duties of the facilitators. The web can be a sophisticated medium both for retrieval information and learning, but it can only facilitate true learning if it meets the needs of those for whom it is employed.

Table 1: Questionnaire survey results

Features	Importance	Level of satisfaction
(A1) Availability at home connection	4.8	3.1
(A2) Technical support from ITS	2.9	3.2
(A3) Minimal set up of browser	4.7	2.4
(A4) Speed of transmission	5.1	3.1
(A5) Compatibility of different platform	4.3	4.0
(A6) Easy navigation	3.6	4.2
(A7) Availability of chat room	3.7	2.8
(A8) Printability of documents	4.7	3.1
(A9) Synchronization of materials	4.3	3.4
<i>(A10) Overall satisfaction of hardware set up</i>	<i>N/A</i>	3.8
(B1) Introduction and explanatory notes	3.3	2.9
(B2) Messages and news	4.9	3.5
(B3) Attractive slides and video clips	4.2	3.2
(B4) Readability of materials	4.1	3.7
(B5) Pre-lecture handouts	4.8	4.1
(B6) Materials not included in syllabus, but useful	3.9	2.8
(B7) Links to external resources (e.g. EPD)	4.4	4.0
(B8) Intranet (Departmental)	3.2	3.6
(B9) Format of documents at Web	4.5	4.1
<i>(B10) Overall satisfaction of materials at the Web</i>	<i>N/A</i>	3.3
(C1) Interactivity of course materials	4.6	3.0
(C2) Facilitator feedback (e-mail/post message)	5.1	2.2
(C3) Facilitators' involvement in chat room	4.3	1.6
(Cc4) Peer discussion at chat room	4.4	3.2
(C5) Online quiz (w/ explanation)	4.9	3.4
(C6) Online tutorials	5.0	2.1
(C7) Animation or video explanation	4.9	2.7
(C8) Online submission (assignment)	4.8	3.5
(C9) Integration of classroom lecture and online activities	5.2	3.0
<i>(C10) Overall satisfaction of instructional design</i>	<i>N/A</i>	3.0

Importance: 1 (least); 6 (most important)

Level of satisfaction: 1 (highly unsatisfactory); 6 (highly satisfactory)

Average score of 143 questionnaires

Table 2: Rank correlation ^[3]

Sample size n		Spearman's rank correlation		Kendall's rank correlation	
		r_s	P-value	r_k	P-value
9	1. Category A	-0.462	0.211	-0.328	0.237
	2. Category B	0.527	0.145	0.423	0.116
	3. Category C	-0.067	0.864	-0.057	0.833
27	All categories	-0.245	0.219	-0.168	0.232

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