

Study on the Factors Influencing the Quality of a Cyber Lecture

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ABSTRACT

There are numerous advantages of online education to the students and to the institution. There are important factors to be considered for a successful online education. The purposes of this paper are to investigate students' viewpoints, called factors, to the cyber class and analyze these factors to be a successful cyber class. For these purposes, we developed and constructed the cyber lecture, and we surveyed student evaluations two times for the cyber lecture in the middle and at the end. We found that students view the cyber class with four factors. Assessments on factors were changed during the cyber class and were different according to students' background.

Keywords: Effectiveness of Cyber Lecture, Factor Analysis

1. INTRODUCTION

There are numerous advantages of online education to the students and to the institution. Online education provides potential students increased access to classes without the inconvenience of time and travel commitments. Institutions benefit from increased enrollment without additional spaces or cost to the institution. Recently, online education programs have been increased dramatically, but the quality of cyber classes has been questioned. Schulman and Sims[1] showed that the learning of the on-line students is equal to the learning of in-class students comparing pre and post-tests of knowledge for both groups of participants. Further, a study of an online technology class yielded the same result[2]. This finding is encouraging to both institutions and students interested in online edu-

cation.

Ryan[3] suggested by comparing between two instructional strategies, online class and in-class lecture, the procedure to achieve the development for custom web site design, construction and administration of an online technology class. Several strategies were suggested by which cyber instructors can take advantage of e-learning environment on the Internet in helping their students[4,5]. As Ryan and others suggested, there are important factors to be considered for a successful online education. The purposes of this paper are to investigate student viewpoints, called factors, of the cyber class and analyze these factors to be an effective cyber class. Once factors are identified, we trace the change of the student assessments on the identified factors during the class. Using these factors, we also examine if there are any differences on the assessment of the cyber class according to student background, such as gender, major, and class. For this purpose, we surveyed student evaluations two times on the cyber lecture in the middle and at the end.

The following section will explain how the cyber lecture was developed and constructed. Section 3 shows the statistical analysis for our purposes and section 4 shows the conclusions.

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2. IMPORTANT FACTORS FOR THE CYBER CLASS

The performance including the users' overall satisfaction to the cyber class depends on the three aspects: system (or environment), contents, and operation of cyber education. The first factor for a successful cyber class is to provide the proper environment. Since the supporting systems, such as servers and networks for the cyber class, are usually hidden to the users, their importance is overlooked. The second one is course content, which the users or students will learn through the Internet. It is very important how the contents for the lesson are made, because the fundamental purpose of education is to teach the knowledge and/or information effectively. The last factor is to manage and operate the cyber classes efficiently.

Integration of instructors, administrators and peer students is a shortcut for success in a cyber classroom. These three factors for the experiment are completed to verify the effectiveness of a cyber education and to compare it with the traditional off-line education.

2.1 Environmental Factor for the Cyber Class

The typical system for a cyber education is described in Fig. 1. A cyber education environment consists of three independent sections: servers, networks, and client systems. First, at least one server, lecture server, must be prepared to construct and edit a cyber lecture. All of the necessary equipment such as digital video cameras, audio systems, electronic chalkboards are connected to this server. The other server, called a web server, is

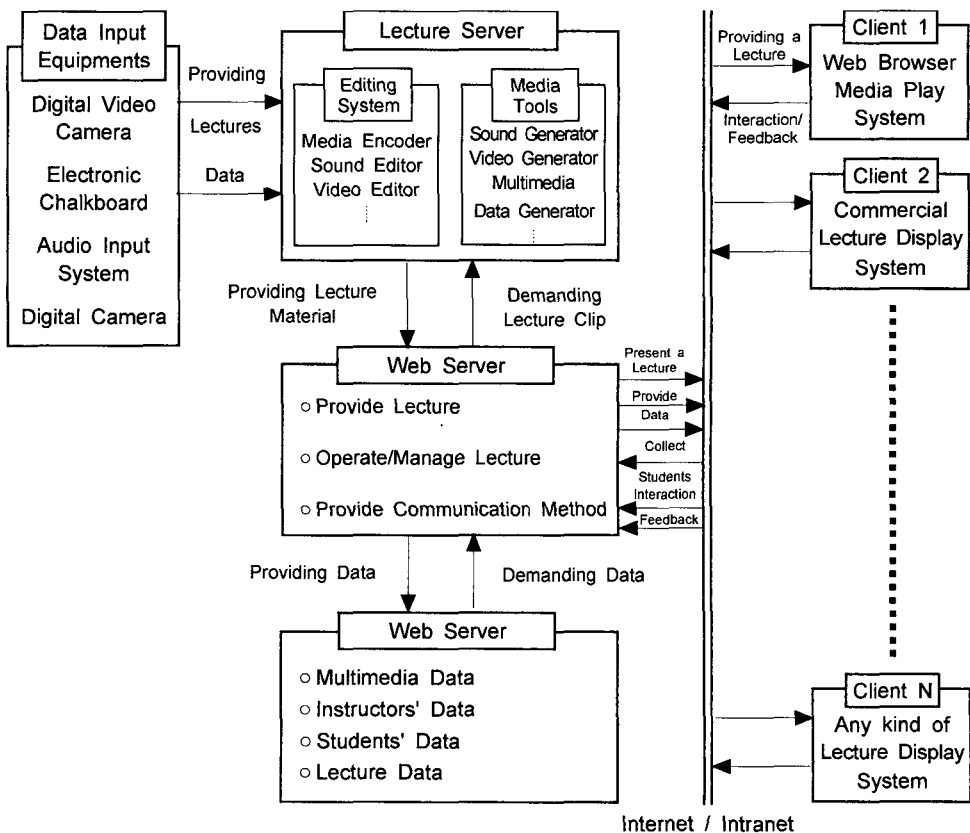


Fig. 1. Cyber Education System

provides real-time multimedia data, the contents of a lecture, and other functions including email and messaging. When the users enter the cyber classroom to take a lecture, this web server also verifies a student and executes all of the procedures for the administration of a cyber class. Another server, called the database server, stores contents of all lectures, administration materials, and other relevant data.

Network infrastructure is an indispensable system for a cyber education. If we do not have a method to deliver a large amount of data between lecturers and students correctly and effectively, a cyber education cannot exist. Currently, a backbone network system in any university provides a sufficient speed for students to take the cyber lectures within the boundary of the university. Moreover, the students have no difficulties to take a cyber lecture at any places such as home and companies since most of the commercialized network systems offer range of Mbps to their customer, which is enough to receive even multimedia data.

2.2 Contents Factor for the Cyber Class

Since the students mostly interact with contents of a cyber lecture rather than the lecturers or other peer students, making a high-quality cyber lecture

becomes an important factor in increasing effectiveness of both cyber education and students. A lecture was divided into different topics in a cyber lecture, and each topic is further divided into several modules. Every module consists of several slides. Fig. 2 describes the detailed components for producing contents for a cyber lecture. The contents of each slide use various multimedia data to get the maximum effect. The proper data for each slide are determined by Slide Analyzer. If data are determined once, they can be either made through the relevant hardware/software equipment such as a digital video camera and editing programs or brought from the database server. The different data types are synchronized by Slide Synchronizer according to topics and the flow of time. Finally, Slide Integrator produces a piece of lecture clip by adding various function and navigation.

The actual and detailed processes to produce a cyber lecture consist of three steps: planning a lesson and making a storyboard according to a plan, creating multimedia data and synchronizing/integrating of data, and testing and modifying. First good planning is the basis for producing a good cyber lecture. The lecturer has to prepare lecture notes for the entire course. Based on the lecture notes, the storyboard is made, which contains the relevant data types for contents and

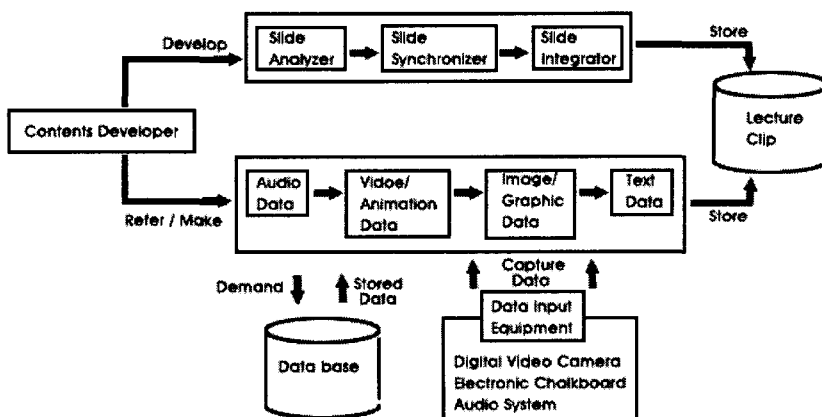


Fig. 2. Cyber Contents Developing Components

the methods for interaction and navigation. The page format, may be used consistently throughout all of the slides in the lecture, is also defined in the storyboard. Another planning step is the creation of relevant data and synchronization/integration of the data for a final lecture. For this step, the required hardware technologies and software tools were standardized and various hardware equipment, software tools and programming languages were used. The method for linking the reference sites is implemented at this step, even though the data are already created. Finally, a step for testing and modifying is needed for more efficient cyber lectures.

To check the efficiency of the learning achievement part and class materials part, we prepared the following survey questions: appropriateness of augmented class material, class contents lead to active participation, effectiveness of class material compare to lecture, acquire enough knowledge, practically usability, positive attitude to cyber class, more concentrative than offline lecture, difficulty of class material, amount of study required, and so on.

2.3 Operation Factor for the Cyber Class

Generally, the success or failure of a cyber education is determined by how active and spontaneous the students are in the cyber. The students' active participation can be encouraged by the proper management and operation of the cyber class. The cyber lecture we made has two distinctive features in this sense. First, our cyber lecture is different from other cyber lectures in that our cyber lecture requires students to perform certain actions in response to the contents in order to continue the lecture. Most cyber lectures look like a film in a theater so that students become the onlookers who are doing nothing. However, our cyber lecture does not proceed if students do not take a relevant action to an event at a certain point of contents.

With various interaction techniques, we provide many communication methods between the lecturer and students for a implementing face-to-face education effect. A large concern was to promote participants' communication and collaboration. This may help to overcome the limited personal interaction with instructors, which is common to off-line classes. Email, electronic bulletin boards, posting boards, and reference boards are examples of communication methods. Moreover, the chatting room and student board, which the lecturer can not enter, are provided for communication among students. The questions and comments on the various boards and e-mail systems are answered at least within a day by the lecturer or teaching assistants.

To check the efficiency of class administration part, we prepared the following survey questions: Communication with other students, Positive participation of instruction, Adequate reply from class management, mutual interaction with instructors and assistants, and so on.

3. STATISTICAL ANALYSIS ON THE SURVEYS OF THE CYBER CLASS

To check how the students consider cyber classes, two surveys were given in the middle and at the end of the class. Our goals to learn from the surveys are following:

- 1) What is the student's viewpoint to cyber class?
- 2) How do these viewpoints change during the cyber class?
- 3) Are there any significant differences on assessment of the cyber class according to gender, colleges, and grade level?
- 4) What are the important items for satisfaction of the cyber class?

Students of the cyber class have different backgrounds such as grade level and college (Table 1). Most of the students are freshmen and belong to liberal arts and social sciences. "SURVEY

Table 1. Cross table of grade, college and survey

frequency SURVEY			COLLEGE				total
			liberal art	social scien.	art& desig	engineer.	
first	GRADE	fresh.	99	169	2	3	273
		sopho	4	1		6	11
		junior	9	15	2	13	39
		senior	3	6	2	5	16
		total	115	191	6	27	339
second	GRADE	fresh	98	163	1	3	265
		sopho	4	1	1	8	14
		junior	9	20	2	14	45
		senior	9	6	2	4	21
		total	120	190	6	29	345

= first” means the data obtained at the first survey (in the middle) and “SURVEY = second” means the data from the second survey (at the end).

3.1 Students’ viewpoints to the cyber class

We used factor analysis [6] on each surveyed data to figure out four factors how the students view the cyber class. According to factor loading matrix, we group 18 questionnaire items into four groups (Table 2). First factor concerns on “learning achievement” and second factor concerns on “class administration” and third factor is “system capability”, and the last factor concerns on “class material”. The first factor is the most important

viewpoint on cyber class and it explains 20.6% of the data. Second factor is also the second most important viewpoint on cyber class, which explains 15.7% of the dat.

3.2 Assessment change on the viewpoint during semester

We use factor scores on four factors to check the assessment change on the viewpoint of the cyber class during the semester. Table 3 shows Two-way Analysis of Variance table with factor score and SURVEY. Comparing factor scores between the two surveys, we found that except for the third factor there was no change. Students felt

Table 2. Result of grouping questionnaire items

Factors	Learning achievement	Class administration	System capability	Class material
Questionnaire Items	<ul style="list-style-type: none"> -Appropriateness of augmented class material -Class contents lead to active participation -Effectiveness of class material compare to offline lecture -Acquire enough knowledge -Practically usability -Positive attitude to cyber class -More concentrative than offline lecture 	<ul style="list-style-type: none"> -Communication with other student -Able to chess on ones learning process, situation and result -Availability of online assistant -Positive participation of instructor -Adequate reply from class manager -Mutual interaction with instructor and assistants compare to offline lecture 	<ul style="list-style-type: none"> -System speed -Convenience of class environment to use -Easy to reproduce moving image and voice 	<ul style="list-style-type: none"> -Difficulty of class material -Amount of study required
% Explain	20.6	15.7	12.4	8.1

Table 3. Analysis of Variance Table

Source		SS	d.f.	F	p
Factor score1 *SURVEY	Between	.016	1	.016	.901
	Within	646	646		
	total	647	647		
Factor score2 *SURVEY	Between	.927	1	.927	.336
	Within	646	646		
	total	647	647		
Factor score3 *SURVEY	Between	11.6	1	11.8	.001
	Within	635	646		
	total	647	647		
Factor Score4 *SURVEY	Between	.201	1	.210	.647
	Within	647	646		
	total	647	647		

that system capability for the cyber class became lower because more students accessed to the server more frequently as the class had been proceeding and many submissions were concentrated around the end of the semester.

3.3 Different assessment according to one's background

We wanted to show if there are any significant differences on assessment of the cyber class according to gender, colleges, and grade level. We investigated four factors in the first data (survey =first) using THREE-WAY ANOVA with a significance level of 0.05. The assessment on the first

factor "learning achievement" differs significantly as grade level changes. Sophomores and juniors have a more positive attitude than freshmen and seniors. The first factor had no difference by gender and college. The assessment on the second factor "class administration" differs significantly between different colleges. The college of engineering and the college of art and design gave positive responses than the college of social sciences and college of liberal arts. The second factor had no difference between gender or grade level. The assessment on third factor "system capability" has no difference by gender, college or grade level. The assessment on the fourth factor "class material" differs significantly by gender. The females felt that the class material was more difficult and that the load of study was higher while the males felt the opposite. Table 4 summarized the results.

3.4 Important questionnaire items for satisfaction of the cyber class

Regression analysis was used to check important questionnaire items that affect the degree of satisfaction to the cyber class. We describe questionnaire items according to the order of importance in affecting satisfaction. The order of items is as follows: acquire enough knowledge (var00017), more concentrative than offline lecture

Table 4. Significant characteristics on each factor

Factor Data	Learning achievement	Class administration	System capability	Class material
First data	Grade level - Sophomore and junior have a more positive attitude than freshmen and senior	College - Engineering and art & design gave more positive response than social science and liberal art	No difference	Gender - Female felt the class material is harder and the load of study is higher than male felt
Second data	College - Engineering and art & design gave more positive response than social science and liberal art	Gender - Female gave more positive response than male	No difference	Gender - Same as the first data College - Engineering gave more positive response than art & design, social science and liberal art

(var00021), convenience of class environment to use (var00010), effectiveness of class material compare to offline lecture (var00016), difficulty of class material (var00012), mutual interaction with instructor and assistants compare to offline lecture (var00027), practically usability (var00018), system speed (var00009), appropriateness of augmented class material (var00014), and amount of study required (var00013).

4. CONCLUSIONS

The performance including the users' overall satisfaction to the cyber class depends on the three component factors: environment factor, content factor and operation factor. Through statistical factor analysis, we know that students view the cyber class with four viewpoint factors: learning achievement, class administration, system capability, and class material. (the order of factors is the order of importance, the most important being first). Those factors cannot be observed through offline lecture because of different teaching environments. To be a successful and satisfactory cyber class, we should first prepare lecture material to increase learning achievement and then consider several ways for class administration. To promote student participation and interaction with the instructor, our cyber lecture requires students to perform certain actions to the contents in order to continue the lecture. Our cyber class does not proceed if students do not a relevant action to an event at the certain point of contents.

One of the students' assessment on four factors is changed during cyber class. System capability factor was assessed lower at the end of the cyber class. We think that term projects were submitted at the end of the class and the size of each project was around 4MB to 5MB. Many submissions were concentrated at one certain period and it exceeded quantity of the hard disk space, which caused returned mail. This factor could be overcome by

extending hard disk quantity.

With respect to background, students of engineering and art & design have more positive attitude than students of liberal arts and social sciences on learning achievement and class material, because students of engineering and art & design feel the topics in the cyber class are necessary for their further study of their major. According to this result, cyber class material should be prepared differently according to student background for each user even if it is the same class.

Through regression analysis, we know that students always compare the cyber class with offline lecture since items affecting cyber class' satisfaction contain offline comparison of concentration (var00021), offline comparison of effectiveness of class material (var00016) and offline comparison of interaction (var00027). Many good aspects of offline lecture should be included in the cyber class using various methods as we used various interaction methods in the cyber lecture.

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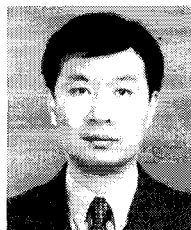


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