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**Comparison of Change of Awareness Related  
to Ability in Blended Classes**

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## **Comparison of Change of Awareness Related to Ability in Blended Classes**

**Isao Miyaji**

### **Abstract**

For last 10 years or so, we have been practicing class session through incorporation of “blended learning”. Such class sessions are generally divided into 3 types which are lecture, exercise and experiment. We have been examining utilized media, change in awareness related to ability, useful activities, etc. for such classes. We will be taking up 10 subjects among such classes and will compare the utilized media in the class by comparing the class development. For 30 items that have common awareness, we will conduct significance test and will compare the difference between the subjects.

**Keywords:** Blended type class, class development, utilized media, change of awareness, class type

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## **Introduction**

At present, by placing higher education institution at the center, “blended learning” is being implemented for the sake of making classes more effective, efficient and attractive (Adachi 2007, Miyaji 2005). It has been reported that implementation method of “Blended Learning” is incorporated for the training sessions in the corporate world (Bersin 2004). The author is moving forward with university education that will nurture problem solving ability with incorporation of making things by hand and rating activities (Miyaji 2006). As the support for the lecture, a proposal has been made to increase study opportunities for various students, and to able to correspond to individual students so that they can prepare/review at “anytime and anywhere” (Central Council 2008).

As a part of such proposal, the author conducted a “blended class” that combined to take a lecture, to use lecture sorting notes distributed, to have mini tests, and to learn by e-learning (learning based on lecture slides and exercise problems, mutual learning and rating of materials drawn up by students). After conducting a survey analysis on lecture method, change in awareness, term recognition, useful activities, etc., the author made a report which concluded such activities to be effective (Miyaji 2009, Miyaji 2011, Miyaji 2012, Miyaji 2013, Miyaji 2014).

On the basis of these outcomes, by targeting elementary school, middle school, high school, university, professional school, corporations, etc., a book on “blended learning” called “Toward Blended Learning from E-learning” was edited and published through gathering the procedure of efficient, effective, and attractive blended class, and the effect of practice in such class (Miyaji 2009a).

In this paper, by using information related to awareness, 10 subjects that were set up as a class design and were put into practice will be categorized into 3 class type groups. We will identify the characteristic of class type group of categorized subjects by using the awareness growth, utilized media and required time for such growth/media.

## **Research Purpose**

In order to find out the kind of difference concerning the effect of utilized media and its implementation method that exist among the subject of blended class implemented at information related department in University A, we will compare class method, utilized media, the result of awareness survey conducted before/afterwards, and activities that are useful for awareness improvement that was surveyed afterwards. We will identify the kind of difference that exists between the learning effect of each type when categorizing subjects into lecture type class, exercise type class, and experiment type class.

## **Class Type**

The class will be generally divided into lecture type class, exercise type class, and experiment type class. The lecture type class is held in a class room setting where an instructor faces the students, and since such class is often held by partially combining exercise, etc., it is regarded as a lesson form with emphasis on assembly style learning.

The exercise type class is a type of class which enables students to gain deeper understanding on their learned materials by first making them solve problems/topics and afterwards provide them with answers and commentary for such materials. It is a lesson form that combines individual learning as main and assembly style learning as secondary.

The goal of information science related experiment type class is to verify the theory and basic principle of information science, to promote permanent understanding of knowledge, to master basic operational skill of experiment, and to nurture strict and steady work attitude. It is a lesson form that experientially enables students to learn basic programming, algorithm, and computer operation skill through actually operating the computer. This is a lesson form with emphasis on individual learning with eventual submission of report.

## **Comparison Method**

When making general division of surveyed question items, they are divided into general awareness and awareness related to subject. As the example of rating items of awareness survey that was conducted, rating item of Subject A is to be shown on Table 1. At the beginning and end of the class for each subject, we have asked students to respond to the rating item of Table 1. Through significant test, we will compare just what kind of difference exists between the changes in general awareness that students have responded. We will also compare to see if there is difference between the numbers of activities that are useful in improving awareness through significant test.

**Table 1.** Example of Rating Items of Awareness Survey for Subject A

Attitudes	Attitudes toward abilities
G e n e r a l  a w a r e n e s s	(1) Interest in and curiosity about computers
	(2) Understanding of computers
	(3) Computer operation skills
	(4) Computer usage methods and broadening of situations
	(5) Ability to set challenges, ability to discover problems
	(6) Ability to plan, to do things in a planned manner
	(7) Cultivation of understanding of knowledge learned
	(8) Ability to study by oneself, ability to learn
	(9) Ability to gather information, ability to conduct research
	(10) Ability to sort through related information or data
	(11) Ability to analyse information
	(12) Ability to express thoughts in writing
	(13) Ability to express thoughts through media other than writing
	(14) Ability to talk to and explain to others comprehensively
	(15) Ability to make presentations
	(16) Ability to listen to others and to ask questions to others
	(17) Communication ability
	(18) Ability to appropriately self-evaluate one's thoughts
	(19) Ability to appropriately evaluate other people's thoughts
	(20) Ability to correct and improve on one's own thoughts
	(21) Ability to pursue matters deeply, ability to explore matters
	(22) Ability to execute, ability to practice, ability to put into action
	(23) Ability to cooperate and to learn concertedly
	(24) Sense of accomplishment, sense of satisfaction
	(25) Sense of fulfilment, sense of achievement
	(26) Ability to solve problems
	(27) Ability to construct and create knowledge
	(28) Ability to think, consider and come up with ideas by oneself
	(29) Creativity/ability to create
	(30) Interest in and curiosity about this field
A s u b j e c t s	(31) Knowledge about the history of computer
	(32) Knowledge about the expression of information on a computer
	(33) Knowledge about the basic unit of computer
	(34) Knowledge about the principle by which a computer works
	(35) Will to take a Fundamental Information Technology Engineer Examination

**Utilized Media of Subjects**

We will make a comparison on media that was utilized for 10 subjects of information related course at University A. Lecture type classes are 5 subjects of A to E subjects, exercise type classes are 3 subjects of F to H subjects, and experiment type class are 2 subjects consisting of subject I and J.

We have categorized the frequency of media utilized during class or outside of class into 5 levels and show it on Table 2. The 5 levels ☉, ○, □, △ and blank on Table 2 show that each of them is “almost used every week”,

“used 4 to 5 times that amounts to roughly 1/3”, “used twice”, “used once”, and “no use” respectively.

**Table 2. Media Used in Each Subject**

Class Type		Lecture					Exercise			Experimen	
Kind	Media name	A	B	C	D	E	F	G	H	I	J
	Answer slide of small test	⊙	⊙	⊙	⊙						
	Answer slide of exercises						⊙		○		
	Lecture by the slide	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
	Document which commented on class content			⊙			⊙			○	○
	Textbook	⊙	⊙		⊙	⊙		⊙	⊙		
	Experiment book									□	□
	An exercise program and problems							⊙			
	Peer evaluations of the work									○	○
	Document which explains on the challenge to address voluntarily							□			
	Peer evaluations on the voluntary challenge program							□			
L	Form for term recognition survey	□	□	□	□	□	□	□	□	□	□
e	Form for attitude survey	□	□	□	□	□	□	□	□	□	□
c	Form for exercises	⊙	⊙				⊙		⊙		
t	Form to describe a flow of the history			⊙							
u	Small test	⊙	⊙	⊙	⊙						
r	Notebook to arrange lecture contents	○	○		○						
e	Document which explains a lecture plan and a method	△	△	△	△	△	△	△	△	△	△
	Document which explains challenges to comment on a term	△	△								
	Document which explains to introduce the historical person			△							
	Document which explains the design method of the class of information studies				△	△					
	Form to design the class of information studies				⊙	○					
	Form to answer calculation problems						⊙				
	Question vote						⊙				
	Clicker						⊙				
	Image scanner										⊙
	PC	△				○		⊙	⊙	⊙	⊙
	Learning by the slide	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
	Learning by the exercise	⊙	⊙	⊙	⊙	⊙	⊙		⊙		
	Browsing of answer slide of small test	⊙	⊙	⊙	⊙						
E	Browsing of report which comments on a term	□	□								
l	Browsing of the report				○	○					
e	Browsing of report which introduces the historical person			□							
a	Evaluation sheet	○	○	○	○	○	○	○	○	○	○
r	Example program							○			
n	Frame of report which comments on a term	△	△								
i	Frame of report	△	△		△	△	△	△	△	△	△
n	Frame of report which introduces the historical person			△							
g	Frame for the design method of the class of information studies				△	△					
	Notebook to arrange lecture contents	○	○		○						
	Question email	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
	Bulletin board	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙

⊙: “used almost every week”, ○: “used 4 to 5 times”, □: “used twice”, △: “used once”, and blank: “no use”

### Analysis Result

To find out about modification in awareness, ability related awareness survey was conducted through the holding of information related class session. Concerning the ability and awareness that showed signs of improvement due to class session, 2 surveys were taken, once before and once after the class attendance. The rating score for such survey was divided into the following 9

levels: (1. Non-existence, 3. Very small existence, 5. Small existence, 7. Large existence, and 9. Very large existence). The result will be explained by analyzing such survey data of 10 subjects through significant test.

The number of students who submitted both before/after survey of 10 subjects is between 18 and 79 people as shown on Table 1. With respect to the general awareness of 30 items, we have conducted a "t test" that corresponded to difference between rating score before and after survey in rating item shown on Table 1 of each subject's ability and awareness survey. "t Test" results for individual subject are shown on Table 3. The row of Table 3 consists of class type, subject name, number of rating items, number of respondents, number of items that had significant difference, number of items that had tendency for significant difference, ratio (%) of items recognized for significant difference, ratio (%) of items with tendency for significant difference, average of difference in rating score. The column consists of 5 subjects of lecture type, 3 subjects of exercise type, and 2 subjects of experiment type.

In Table 3, the average ratio of the number of rating items recognized for significant difference were approximately 58%, and the average rate of the number of items with tendency toward significant difference were approximately 4%. Based on this, an increase in ability and awareness on approximately 58% of the items is recognized.

For the exercise type class, the average ratio of the number of rating items recognized for significant difference between pre and post rating score of ability and awareness was approximately 41%, while the average rate of the number of items with tendency toward significant difference was 13%. Based on this, an increase in ability and awareness on approximately 41% of the items is recognized.

Significant difference has been recognized for all 30 rating items for the experiment type class. Based on this, an increase in ability and awareness on all of the items, in other words 100% of the items is recognized.

As the result of conducting significant test on general awareness, it divided into subjects that showed significant increase for over 70% of items within lecture type and exercise type, and subjects with significant increase for less than 43% of items. By corresponding to such separation, 10 subjects are divided into large subject and small subject for the elongation of awareness.

On the other hand, 6 subjects were surveyed for awareness related to subjects. All such subjects showed increase in more than 72% of the items. General awareness has significantly increased for every subject, and awareness related to subject has also shown significant increase.



**Table 3.** Comparison of the Results of Significant Difference Test for Awareness Related to Ability

Class type			Lecture					Exercise			Experiment		
Kind	Statistic	Subject name	A	B	C	D	E	F	G	H	I	J	
		Grade	1	2	2	3	3	2	2	3	3	3	
		No. of respondents	79	43	39	18	25	31	27	22	87	30	
a w G a e r n e e n r e a s s	No. of items that awareness improved	Sygnificant difference	25	3	15	9	28	27	5	5	30	30	
		Tendency for sygnificant difference	2	3	6	4	1	2	4	4	0	0	
	Ratio of number (%)	Sygnificant difference	83.3	10.0	50.0	30.0	93.3	90.0	16.7	16.7	100.0	100.0	
		Tendency for sygnificant	6.7	10.0	20.0	13.3	3.3	6.7	13.3	13.3	0.0	0.0	
		Total	90.0	20.0	70.0	43.3	96.7	96.7	30.0	30.0	100.0	100.0	
	Mean	Pre-awareness	4.07	4.80	3.80	4.72	3.93	4.72	4.51	4.84	4.06	4.00	
		Post-awareness	4.84	4.91	4.47	5.31	5.29	5.43	4.89	5.18	5.80	5.63	
		Elongation	0.77	0.11	0.67	0.59	1.36	0.70	0.38	0.35	1.74	1.62	
		Standard deviation	2.07	1.78	2.18	1.62	1.72	1.30	2.19	1.52	1.36	1.40	
		Singnificance probability	***	*	***	***	***	***	***	***	***	***	
		Maximum elongation	1.63	0.86	1.09	1.83	2.16	1.25	1.20	2.00	2.34	2.19	
		Minimum elongation	-0.43	-0.35	0.35	-0.06	0.20	0.46	-1.09	-0.50	1.24	1.18	
	r e s u b j e c t s	No. of items that awareness improved	Sygnificant difference	4	4	—	12	—	3	14	4	—	—
			Tendency for sygnificant difference	0	0	—	0	—	0	4	0	—	—
Ratio of number (%)		Sygnificant difference	80.0	80.0	—	85.7	—	75.0	56.0	80.0	—	—	
		Tendency for sygnificant difference	0.0	0.0	—	0.0	—	0.0	16.0	0.0	—	—	
		Total	80.0	80.0	—	85.7	—	75.0	72.0	80.0	—	—	
Mean		Pre-awareness	3.06	3.97	—	4.16	—	4.27	3.90	3.37	—	—	
		Post-awareness	4.89	4.83	—	5.41	—	5.43	4.91	5.04	—	—	
		Elongation	1.83	0.87	—	1.25	—	1.16	1.01	1.70	—	—	
		Standard deviation	2.28	2.21	—	1.6701	—	1.34	2.43	2.08	—	—	
		Singnificance probability	***	***	—	***	—	***	***	***	—	—	
		Maximum elongation	2.48	1.26	—	1.94	—	1.54	2.65	2.00	—	—	
		Minimum elongation	0.24	-0.33	—	0.50	—	0.29	-0.66	0.91	—	—	
No. of activities per a student		Mean	1.71	1.11	1.38	1.42	1.78	2.21	1.52	2.34	2.44	2.23	
		Standard deviation	0.25	0.15	0.11	0.27	0.27	0.55	0.17	0.39	0.36	0.27	

\*\*\* p<.001, \* p<.05

### Conclusion

With respect to 10 subjects that implemented blended class, through conducting of significant difference test, principal component analysis, cluster analysis and discriminant analysis, a comparison was made on average score of 124 items of 4 types of data related to ability and awareness. As such results, the followings were obtained:

(1) For lecture type class G1, the average number of rating item recognized for significant difference or such tendency was approximately 50.7%

(2) For exercise type class G2, the average number of rating items recognized for significant difference or such tendency was approximately 63.3%

(3) For the average of experiment type class, significant difference was recognized for most of the rating items, and the average number of rating items recognized for significant difference was approximately 98.9%.

(4) As results of the significant difference tests for general awareness, the subjects in the lecture type and the exercise type are divided into subjects whose number of significantly improved item is 70% or more and is 43% or less. In response to it, subjects are divided into subjects with small elongation of awareness and subjects with large one.

(5) Awareness related to subject improved with the items more than 72% for all of subjects.

(6) With respect to all of the subjects including general awareness and awareness related to subjects, significant improvement is shown on average rating score for all of awareness items.

As a future challenge, not just limiting to these 10 subjects that were object of this analysis, but we would also like to analyze rating score of ability and awareness survey for other subjects, to further solidify the information gained in this paper.

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