

# Classification and Characteristics of Students Groups Using Change of Attitude in Class for Creating Slides to Present Product

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## Abstract

The creation of product presentation slides using PowerPoint was implemented in order to ensure that students acquire the knowledge and information literacy required to use computers. Students created slides presenting products in which they were interested, inserting animation and recording narration. This class combined evaluation and revision activities. Along with enhancing computer skills, awareness relating to a variety of skills required for problem solving were enhanced in an attempt to cultivate independent thinking skills. In particular, the aim was not only to enhance PowerPoint skills, but also to improve expressiveness, planning ability and ability to make proposals. This paper reports the contents and change of attitude in the class to create product presentation slides. Principal component analysis and cluster analysis are conducted using elongation in assessed values. As a result, students are classified in some groups and characteristics of each group is reported. Important categories for group are extracted through discriminant analysis. Significance difference test for change of awareness related to abilities peculiar to this class will be reported. Finally it is considered those results.

**Keywords:** product presentation, creation of slides, evaluation activities, revision activities, problem-solving ability, higher education

## 1. Introduction

There have been many attempts to propose new class methods and implement effective classroom practice in the past. Recently, the Central Council for Education pointed out that a switch to active learning in which students independently detect problems and find solutions is essential. It is reported that active learning will be implemented in order to promote high quality undergraduate education that stimulates independent study in order to accumulate independent study experience and acquire skills for lifelong learning (Ministry of Education, 2012). Some classroom practice showed that it was possible to develop classes that implement active learning, to enhance problem-solving ability and cultivate independent thinking skills by incorporating self-evaluation, evaluation by others and repeated revision tasks for some tasks for university students (Miyaji, 2009). We believe that it is possible to cultivate the skill to solve these problems by creating things that people desire and things that people will use.

There are some studies concerning storytelling (Figg, 2010; Kelleher, 2007; Tsou, 2006; Zipes, 1995). Creative activities that produce works that inform and entertain people by describing real and imaginary events, using graphics, narration, and music are called storytelling (Figg, 2010; Zipes, 1995). In digital storytelling, still pictures such as photographs, figures, and drawn pictures are displayed sequentially to create a storytelling and narrated. Digital stories can be easily reconstructed. Still pictures are easy to handle for the producers of such assignments, and students can reflect upon memories or what they have learned through reviewing still pictures (Barrett, 2006). In experiments for one of the themes, creation of storytelling, computer science experiments for required 3-hour/week subjects in the 3rd year, had students creating projects that looked at the students themselves and asked them to talk about themselves in order to promote self-understanding (Miyaji, 2012). This creation process incorporated evaluation and revision activities and it was reported that it was possible to cultivate skills to solve tasks (Miyaji, 2016).

Creation of storytelling had students create projects that looked at the students themselves and they were asked to talk about themselves in order to promote self-understanding. In this paper, classes to create slides to present products were implemented using PowerPoint. In this study, the aim was not only to enhance PowerPoint skills, but also to improve expressiveness so as to understand to be plain by reviewing slides, planning ability to

press-agent a product so as to let a person mind to buy it, and ability to make proposals to better the product developed in-house through creation of slides to introduce products which they were interested in. This is an active learning in which it is not possible for students to complete their project unless they participate actively in classes. Students created slides presenting products in which they were interested, inserting animation and recording narration. Students viewed each other's slide and learned from each other. Mutual evaluation was used for interaction, students evaluated others and commented. Following this, slides were revised by referring peer assessment and the students again viewed and evaluated each other's slides. By actively participating in evaluation and revision activities while interacting, awareness relating to a variety of skills required for problem solving was enhanced in an attempt to cultivate independent thinking skills. Useful activities for improving awareness and change of evaluation by others to create slides to present products has been already reported (Miyaji, 2015).

Below is an explanation of class contents, project contents, creation methods and evaluation sheet contents. The total number of hours required for research, project narration time, change of attitude in the class will be first reported. Principal component analysis using elongation in assessment values will be conducted, and cluster analysis will be conducted using principal component scores to classify students into some groups. As a result characteristics of student groups classified is reported. Important categories for group will be extracted through discriminant analysis. Significance difference test for change of awareness related to abilities peculiar to this class will be reported. Finally it will be considered those results.

## 2. Class Contents

The target was the IT subject displayed in Table 1, a required subject for the second semester of the 3rd year Computer Science course at University A. In this class, students chose their preferred theme from three possibilities and worked on this theme in 15 classes. Approximately one third of the class students attended (29 students). The students are all Japanese and consist of one female and 28 males. Each class was 90 minutes long and each student created two projects. The class was taught according to the plan in Table 1. The first seven classes were used to create slides presenting products and the next seven classes were used to create slides presenting books. Viewing and evaluations were carried out twice and revisions were carried out once.

Table 1. Class plan

Time	Class plan	Plan related to assignment
1	Explaining Experiment method	Problem description, information retrieval, considering the description to introduce, inputting evaluation sheet 1
2	Creating slides to introduce products	Submission of the entry form, creating slide
3	"	Creating slide, putting the animation
4	"	Creating slide, recording narration, writing report 1
5	Evaluation and correction of slides to introduce products	Mutual evaluation, inputting evaluation sheet 2, modifying slide, writing report 2
6	Evaluation of slides to introduce products and report	Mutual evaluation, inputting evaluation sheet 3, writing report 3
7	Completion of the report and the evaluation	Completing report and evaluation sheet

### 2.1 Purpose of Class

This paper reports on the classes to create slides presenting products. The aim of these classes was to ensure that students acquire knowledge about computers, they have learned about through classes in which they actually use computers and to utilize this knowledge. Furthermore, students selected the product they were interested in and created six slides with product details and features, why they liked the product, advertising, positioning in terms of competitors' products and proposals to improve the product. Students incorporated movement into the slides using animation so that the contents were easier to understand. Students created the contents of explanations in order to narrate the slides and then recorded this narration to complete slides to be viewed by the whole class. By doing this, expressions using images as well as written expression was cultivated. By creating product presentation slides, evaluation activities were incorporated into the creation, awareness relating to a variety of skills required for problem solving was enhanced and independent thinking skills were cultivated.

In the creation of slides, it was important to create explanations to present the product and students were encouraged to think about the composition of product images and photos and how to express them. Students learned the importance of communicating their own thoughts and ideas to other people and thinking about how to convince people to buy the product by placing details, images, animation and narration in the appropriate places. In this class, after creating slides, students viewed the slides, noted the reaction to them and reviewed

their projects.

### 2.2 Class Plan

A 39-page experiment booklet as detailed in Table 2 was distributed in the first class. Based on this booklet, there was an explanation of the aim of the class, its contents, plan, how to create slides and the experiment method. A sheet (the size of 2 A4 sheets) to fill in was distributed as shown in Figure 1. Students were told to create a product presentation, fill in the right side of the sheet and draw on the left by the next class.

The second class gave an explanation of how to incorporate animation and the students created the product presentation slides.

The third class explained how to write reports and record navigation and students incorporated their animations.

The fourth class had student record narration and complete the product presentation slides. Files with product presentation slides were submitted at the end of this class. The teacher then amalgamated all the projects into one.

The sheet for evaluation by others sheet was distributed in the fifth class, all the projects were viewed and evaluated and the evaluation sheets were submitted. Using the sheet, a teacher annexed others evaluation, sorted the rating level in student numerical order, and arranged and gathered it every student. A teacher registered the file with e-learning and allowed a student to download it. Following this, student revised their projects in reference to the rating level.

The revised product presentation slides were viewed again in the sixth class, evaluation was conducted again and evaluation sheets were submitted.

Students wrote one third of their reports for the days before the fourth, fifth and sixth classes and these were returned to the students with suggested revisions during the classes.

Reports were completed in the seventh class and all evaluation worksheets were completed and submitted.

Table 2. Experiment booklet contents

Contents	No. of pages
1. Purpose	0.1
2. Experiment contents	0.4
3. The effect that an experiment provides	1.0
4. Experiment plan	0.2
5. Digital portfolio	0.1
6. Use of the learning system of administration	0.3
7. How to make the slide by PowerPoint	2.0
8. How to set the animation	7.0
9. Manual which is necessary for an experiment	0.7
10. Experiment method	3.0
11. Experimental attention	0.2
12. Things to bring to an experiment	0.1
13. Things to prepare by the class of the second week	0.1
14. How to present the report	1.1
15. Reference books	0.1
16. How to write the report	22.0
17. Things to submit	0.1
Total	38.5

Student number: \_\_\_\_\_ Name: \_\_\_\_\_

Contents to present product: **Write a product introduction sentence**

**1. Product Name**

Title \_\_\_\_\_  
Student Number \_\_\_\_\_  
Name \_\_\_\_\_

**2. Product Details**

**3. Product Features**

**4. Advertising**

**5. Positioning for Competitors' Products**

**6. Proposals to Improve the Product**

**Draw the picture as imaged**

A mechanical pencil and two colors of ball-point pens are usable. Because this is thin, this is in the breast pocket completely.

Figure 1. Example which a part of contents is filled and drawn in product presentation details sheet

### *2.3 Contents of Reports and Files to Submit*

The files of the framework for product presentation documents, the framework for reports and evaluation sheet were available to download from an e-learning site. The teacher created the evaluation sheets required for class evaluation activities as evaluation worksheets. These were self-evaluation sheets, sheets for evaluations by others, evaluation sheets evaluated by others, sheets for evaluation of awareness relating to improved skills and sheets for information literacy, etc. Students downloaded the files, filled in the applicable details and submitted them.

### *2.4 Contents of E-Learning*

To advance this class smoothly, e-learning functions were used as follows: (1) browsing the assignment; (2) downloading experiment booklet, product presentation details sheet, report template, evaluation sheet, and slide sample; (3) submitting and uploading report, evaluation sheet, and slides to present a product; (4) e-mail.

## **3. Results Contents of Production Presentation Slides Created by Students**

The aim of the theme was to think about how to convince people to buy products such as electronic or industrial goods, by presenting with slides about a product in which the student was interested or that the student recommended that other people to buy it after the student thought about how to convince people to buy it. In the future, hypothetical product development plans can also be considered. Students were asked to select a specific product and insert images of this product without exception.

Presentations are composed of six slides. The slideshow is no longer than two minutes. The font size is 28 or more, as much as possible.

The contents of the six slides were composed as follows:

#### (1) Product Name and Catchphrase

The title should be a catchphrase such as “(adjective) product” or “X product is (adjective)”. It should be a concrete presentation of a product that is currently on sale.

#### (2) Product Details

Clearly state product name, company name, product details, model number, year of launch, etc. Include an explanation of what the product does in the product details. Explain what kind of object the presentation is about.

#### (3) Product Features and what the Student likes about the Product

Explain production functions, convenient points and good points, etc. Present what they liked about the product when they used it. Explain the reason for recommending the product and its appeal. Explain impressions from use and convince the viewer to buy the product.

#### (4) Advertising

Create newspaper/magazine advertising or newspaper insertion advertising. Create advertising by considering ways to appeal to the consumer in order to convince them to buy the product.

#### (5) Positioning in Terms of Competitors' Products

Display product sketch, specifications, prices, amount sold, market share, competitor information and points for each company name and product name to demonstrate the position of the presented product in terms of competitors' products. Use graphs and tables to give a visual image.

#### (6) Proposals to improve the Product

Think about inconvenient points and functions that could be added. On the basis of making a proposal to the company, consider sales strategy and methods to promote sales in order to sell more units than are being sold currently and make proposals to improve the product.

## **4. Results of Analysis**

Six types of survey were used in order to understand the learning effects of creating the product presentation slides detailed in the previous section. The foundation of learning was considered to be in securing time for each activity, therefore time relating to class activities was surveyed on report sheets. Next, project narration time was analyzed and the time required for viewing the projects was investigated. Awareness relating to skills was surveyed before and after the class and, through these changes, it was possible to understand the level of achievement of the aim of the class. Principal component analysis was conducted using improvement in awareness. Cluster analysis was then conducted on the score obtained from principal components, and students were classified into four groups. Discriminant analysis was conducted for the groups and the characteristics of

each group were defined.

Below, the results of statistical significance are acceptable with a significance level of 5%. The symbols m, SD, t and p represent mean, standard deviation, test statistic and (significant) probability respectively. Significance levels of 0.1%, 1%, 5%, 10% are represented by \*\*\*, \*\*, \*, + respectively.

#### 4.1 Time Taken for Each Part of Experiment

The total number of hours required for research in order to provide explanations and create slides, to work on the creation of product presentation slides and to write the report was stated on the title page of the report. These times were aggregated and averages are shown in Table 3. The average time taken for the project was 19.8 hours of which approximately 5 hours was class time and an average of approximately 15 hours was spent for creating slides and writing the report outside the class.

Table 3. Time taken for each part of class (Hours)

Necessary time	Survey	Creating slide	Writing report	Total
m	4.9	7.3	7.7	19.8
SD	2.5	3.1	3.1	6.3

#### 4.2 Project Narration Time

Twenty-eight students submitted product presentation slide files. Approximately two minutes was required to view each project and approximately one minute was required for evaluation by others. Narration times for projects created by students are shown in Table 4. There were six PowerPoint slides with a total runtime of 115.2 seconds. The first slide was the title page therefore the time used was slightly shorter than the others. By limiting the number of PowerPoint slides to six, time taken was approximately 1.92 minutes. Maximum and minimum times taken were 223 seconds and 62 seconds respectively. Most projects were close to the time limit which was set at two minutes.

Total viewing time and time for evaluation by others was approximately 90 minutes. Due to this, class time was slightly exceeded.

Table 4. Project narration time (seconds)

Slide No.	1	2	3	4	5	6	Total
m	9.3	18.7	28.4	16.5	24.1	22.4	115.2
SD	5.4	7.1	11.8	8.4	14.1	10.6	51.7

#### 4.3 Changes in Awareness Relating to Skills

Awareness relating to skills shown in Table 5 was recorded on the evaluation sheet before the class (1st class) and after the class (7th class) and submitted. There were the following nine grades for evaluation: 1. None at all, 3. Slight awareness, 5. A little awareness and 9. Extremely high awareness. Twenty-seven students responded to both pre- and post-class questions concerning awareness. Average assessment values for the 30 categories of awareness relating to skills in pre- and post-class showed a significance level of 0.1 as a result of paired statistical significance tests ( $t(809)=23.1^{***}$ ,  $p<0.001$ ). Overall, it was demonstrated that students felt improvements in awareness relating to skills.

The results of paired statistical significance in pre- and post- class average values assessed for each category for awareness relating to skills showed statistical significance in all 30 categories. It was understood from this that students felt that all awareness relating to skills had improved. In this way, it was understood that awareness of skills and emotions relating to problem-solving in the classes held had an improving effect.

The test results in Table 4 showed improvements in (1), (2), (3) and (4). Consequently, one of the aims of this class, to ensure that students acquire knowledge about computers, they have learned about, can be considered to have been achieved, at least in terms of awareness.

31, 26, 26, 6, 6, 4, 3, 2, 1, 1, 1 and 1 students filled in the learned how to or how to use narration, PowerPoint, animation, self-objectification, appropriate evaluation by others, written expression, presentation, Word, microphone, Paint, BGM and touch typing respectively in the report in which students wrote about what they

had learned from the experiment. The total number of written comments was 108, giving an average of 4.0 per person. All students wrote that they had become able to do one of the above. One more aim of the class, to enhance computer skills, can be considered to have been achieved according to student reports.

Through the creation of product presentation slides, written expression skills were cultivated by writing a presentation text and reports and expression skills other than in the written form were also cultivated not only by inputting explanations into slides but also by pasting in product images or related photos. Enhancing awareness of a variety of skills which is required for problem-solving also significantly improved as shown in Table 6 and awareness aims can be considered to have been achieved.

Table 5. Statistical significance test results for awareness relating to skills

Attitude related to Ability	Before		After		Elongation		t-Test	
	m	SD	m	SD	m	SD	t	p
(1) Interest in and curiosity about computers	4.4	1.4	5.3	1.4	0.9	1.2	3.6	***
(2) Understanding of computers	3.8	1.2	5.1	1.8	1.3	1.5	4.5	***
(3) Computer operation skills	4.0	1.3	5.2	1.4	1.2	1.0	6.0	***
(4) Computer usage methods and broadening of situations	4.0	1.1	4.9	1.3	0.9	0.9	5.0	***
(5) Ability to set challenges, ability to discover problems	3.8	1.0	4.9	1.3	1.1	0.9	6.1	***
(6) Ability to plan, to do things in a planned manner	3.7	1.2	4.8	1.3	1.1	1.2	4.6	***
(7) Cultivation of understanding of knowledge learned	3.9	1.3	5.2	1.2	1.3	1.3	5.2	***
(8) Ability to study by oneself, ability to learn	4.1	1.5	5.1	1.6	1.0	1.2	4.3	***
(9) Ability to gather information, ability to conduct research	4.4	1.6	5.6	1.5	1.1	1.6	3.6	***
(10) Ability to sort through related information or data	4.0	1.2	5.3	1.2	1.3	1.3	5.1	***
(11) Ability to analyse information	4.2	1.2	5.0	1.3	0.8	0.8	5.1	***
(12) Ability to express thoughts in writing	3.9	1.4	5.0	1.5	1.2	1.0	5.9	***
(13) Ability to express thoughts through media other than writing	3.6	1.2	4.9	1.6	1.3	1.3	5.1	***
(14) Ability to speak and explain things to others in an easy-to-understand manner	3.4	1.2	4.8	1.6	1.4	1.1	6.4	***
(15) Ability to make presentations	3.6	1.4	5.0	1.4	1.3	1.2	5.5	***
(16) Ability to listen to what people are saying and ability to ask people questions	4.3	1.7	5.0	1.7	0.7	0.9	4.2	***
(17) Communication ability	4.3	1.7	5.0	1.6	0.7	0.8	4.4	***
(18) Ability to appropriately self-evaluate one's thoughts	4.3	1.2	5.3	1.4	0.9	1.1	4.2	***
(19) Ability to appropriately evaluate other people's thoughts	4.4	1.3	5.1	1.4	0.7	1.0	3.4	***
(20) Ability to correct and improve on one's own thoughts	4.4	1.4	5.2	1.4	0.8	1.0	4.1	***
(21) Ability to pursue matters deeply, ability to explore matters	4.1	1.1	4.9	1.2	0.7	0.9	4.2	***
(22) Ability to execute, ability to practice, ability to put into action	4.0	1.2	4.7	1.2	0.7	0.9	4.0	***
(23) Ability to cooperate with others, ability to study in cooperation with others	4.7	1.6	5.3	1.6	0.7	1.2	2.7	*
(24) Sense of accomplishment, sense of satisfaction	4.3	1.5	5.2	1.5	0.9	1.3	3.3	***
(25) Sense of fulfilment, sense of achievement	4.4	1.5	5.2	1.5	0.7	1.2	3.1	**
(26) Ability to solve problems	4.3	1.4	5.0	1.4	0.7	1.0	3.4	***
(27) Ability to construct and create knowledge	3.9	1.4	4.7	1.6	0.8	1.0	4.1	***
(28) Ability to think, consider and come up with ideas by oneself	4.1	1.4	5.1	1.4	1.0	1.2	4.4	***
(29) Creativity/ability to create	4.2	1.5	5.0	1.3	0.7	1.3	3.0	**
(30) Interest in and curiosity about this field	4.7	1.5	5.3	1.6	0.7	1.5	2.3	*
Average	4.1	1.4	5.1	1.5	1.0	1.2	23.1	***

\*\*\* p<.001, \*\* p<.01, \* p<.05

#### 4.4 Principal Component Analysis for Elongation in Awareness

Principal component analysis will be conducted using elongation in values assessed in section 4.3, and cluster analysis will be conducted using principal component scores and, as a result, students are classified in some groups in section 4.5 in order to understand what kind of characteristics each group have in each factor. Firstly, principal component analysis was conducted using a method with a variance-covariance matrix with the elongation found from the difference between values assessed before and after the class for the 30 categories of awareness relating to skills in Table 5. Loads after extracting principal components 1 and 2 were 35.7% and 12.5% respectively. The accumulated load was 48.2%. Table 6 shows evaluation categories in order of coefficients for component 1 of the component matrix.

The coefficients of evaluation categories in component 1 were between 0.80 and 0.17 and all categories can be

considered as integrated variables. From this, component 1 was named Comprehensive skills required for problem solving. In addition, the coefficients of evaluation categories in component 2 were between -0.57 and 0.57. Component 2 had large positive coefficients such as (15), (25) and (24) and large negative coefficients such as (28) and (8). Accordingly, positive direction was named “Awareness relating to presentation/sense of fulfillment and sense of satisfaction” and negative direction was named “Awareness relating to skills for learning and thinking.” The elongation in awareness relating to the creation of product presentation slides can be explained by these two components.

Table 6. Coefficients of component matrix concerning awareness

Attitude related to ability	Component 1	Component 2
( 7) Deepening of understanding of learned knowledge	.80	-.03
( 5) Capability to set a theme and problem finding capability	.75	-.12
(30) Interest and concern with this field	.72	.30
( 4) Computer utilization method and expansion of scene	.72	-.02
( 2) Understanding of computers	.71	-.26
( 9) Information collection capability and investigation capability	.70	-.28
(20) Capability to correct and improve what has been figured out by oneself	.70	.38
( 3) Computer operating skill	.70	-.15
(24) Sense of fulfillment and satisfaction	.69	.51
(26) Problem-solving capability	.69	-.26
(25) Sense of accomplishment and sense of achievement	.67	.55
(19) Capability to evaluate properly what has been figured out by others	.66	.36
(13) Capability of expressing own thought other than in sentences	.63	.19
(10) Capability to sort out and sum up information and data	.63	-.40
(18) Capability to self-evaluate properly what is figured out by oneself	.60	.21
(12) Capability to express one's own thought by sentences	.60	.22
( 1) Interest and concern with computers	.59	-.40
(29) Creativity and capability to create	.56	-.47
( 8) Capability to study and learn independently	.49	-.54
(17) Communication capability	.49	.33
( 6) Capability to plan and to project things	.47	.04
(23) Capability to co-operate and to learn concertedly	.47	.49
(27) Capability of composing knowledge and creating knowledge	.45	-.35
(28) Capability to think independently	.40	-.57
(14) Capability to talk to and explain to others comprehensively	.35	-.10
(22) Capability to perform, practice and execute	.32	-.04
(15) Presentation capability	.30	.57
(11) Information analysis capability	.22	.26
(21) Capability to pursue things thoroughly and spirit of inquiry	.21	-.23
(16) Capability to listen to others and to raise questions to others	.17	.29

#### 4.5 Classification of Students with Principal Components for Assessment Values for Awareness

Cluster analysis was conducted for elongation in assessment values with the principal component scores found in section 4.4 as variables. The 27 students who were the targets of analysis were divided into four clusters (Groups S1 – S4). The 4 groups are shown in Figure 2 using the scores of principal components 1 and 2.

Group 1 (S1, circle) contained 14 students as shown in the bottom left of the figure. Average elongation was 0.42 and the lowest of all four groups. This group had the lowest score in comprehensive skills required for problem solving. The average improvement was low for all students and average improvement for each student was between -0.33 and 0.93. This group of students showed only a little improvement overall in comprehensive skills required for problem solving.

Group 2 (S2, square) contained three students as shown in the top left of the figure. Average elongation was 1.64 and the highest of all four groups. Average elongation for each student was between 1.33 and 1.93. This group of students showed higher than average elongation overall and made the most improvement. From this, it was demonstrated that there was marked improvement in skills relating to computers.

Group 3 (S3, plus) contained one student as shown in the bottom right of the figure. Average elongation was 1.60. The elongation of this student in (23) Collaboration skills, (24) Sense of satisfaction and (25) Sense of fulfillment were negative and this student showed no improvement in these categories only.

Group 4 (S4, triangle) contained the middle nine students. Average elongation was 1.47 and average elongation for each student was between 1.37 and 2.00. This group of students had the second highest average assessment values. Average elongation for all students was higher than the average elongation of 0.95.

In order to comprehend the characteristics of the divided student groups, cluster analysis was conducted by the Ward method using elongation in assessed values of awareness by setting awareness as its case and elongation of awareness as the variable. Awareness was divided into five clusters G1 – G5 from the dendrogram. Group 1 was composed of 21 awareness categories: (4), (5), (3), (7), (6), (27), (28), (29), (26), (8), (24), (25), (19), (20), (17), (23), (11), (16), (21), (22) and (18). Of these, categories in which there was marked improvement were: (20), (17), (5), (8) and (28). Therefore, this group was named “Skills in communication, learning, thinking, setting tasks, revision and improvement.”

Cluster G2 was composed of four awareness categories: (12), (13), (14) and (15). Therefore this group was named “Skills in expressing thoughts and explaining.”

Cluster G3 was composed of two awareness categories: (1) and (2). Therefore this group was named “Interest in and understanding of computers.”

Cluster G4 was composed of one awareness category: (30). Therefore this group was named Interest in the field.

Cluster G5 was composed of two awareness categories: (9) and (10). Therefore this group was named Skills in collecting and organizing information.

Averages and standard deviation for each group are shown in Table 7. The results of two-factor-analysis of variance for elongation in awareness for each group are shown in Table 8. Interaction was significant as a result of this ( $F(12,790)=5.9$ ,  $p<.001$ ). It was significant for student groups. It was also significant for awareness groups. Accordingly, the results of multiple comparison are shown in Table 9.

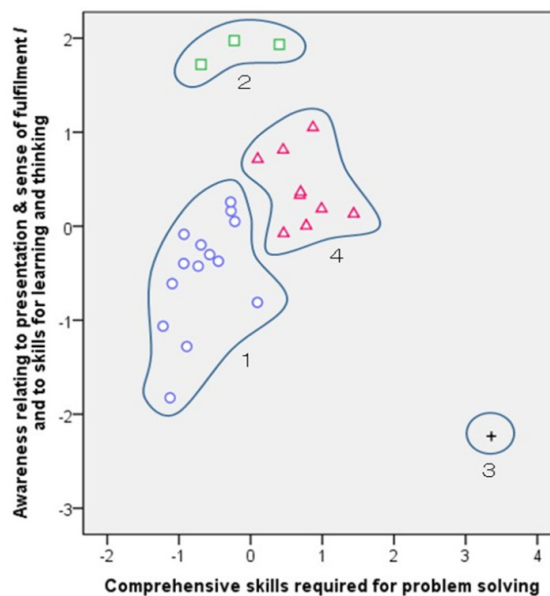


Figure 2. Four groups of students expressed on the two component plane

From these results, it was discovered that student group S1 had the lowest levels of elongation for almost all awareness groups.

It was discovered that student group S2 had the highest levels of elongation for almost all awareness groups. This student group S2 can be said to be a group in which there was marked elongation in Skills in expressing thoughts and explaining.

It was discovered that student group S3 had the high levels of elongation for awareness group G3 and the highest levels of elongation for the G5. This student group S3 can be said to be a group in which there was marked elongation in Interest in and understanding of computers and Skills in collecting and organizing information.

It was discovered that student group S4 had medium levels of elongation for all awareness groups.



Table 7. Averages and standard deviation for each group

Awareness group	Student group	S1		S2		S3		S4		Whole	
	No. of students	14		3		1		9		27	
	No. of items	m	SD	m	SD	m	SD	m	SD	m	SD
G1	21	0.38	0.06	1.33	0.12	1.14	0.22	1.44	0.07	0.42	0.85
G2	4	0.91	0.13	3.00	0.29	2.00	0.50	1.22	0.17	1.64	1.32
G3	2	0.25	0.19	1.67	0.40	4.00	0.70	1.83	0.23	1.60	1.89
G4	1	-0.29	0.26	2.67	0.57	0.00	0.99	1.56	0.33	1.47	1.05
G5	2	0.46	0.19	1.67	0.40	4.00	0.70	1.94	0.23	1.22	1.49
Whole	30	0.42	0.85	1.64	1.32	1.60	1.89	1.47	1.05	0.95	1.17

Table 8. Results of analysis of variance for elongation in awareness for each group

Source of variation	SS	df	MS	F	p
Between student group	154.2	3	51.4	52.4	***
Between awareness group	41.7	4	10.4	10.6	***
Student X Awareness	69.4	12	5.8	5.9	***
Error (residual)	775.1	790	1.0		
Total	1850.0	809			

Table 9. Multiple comparison of elongation in awareness for each group

Group	S1:S2	S1:S3	S1:S4	S2:S3	S2:S4	S3:S4
G1	<	<	<			
G2	<				>	
G3	<	<	<	<		>
G4	<		<			
G5	<	<	<	<		>

4.6 Extraction of Important Categories for Group through Discriminant Analysis

In order to determine important categories for each student group, discriminant analysis was conducted using elongation in assessment values for awareness.

4.6.1 Awareness Categories That Contribute to Discrimination

The results of discriminant analysis of elongation in assessment values for awareness for each student group S1 – S4 showed three discriminant functions and their eigenvalues were 412.2, 9.6 and 7.7 respectively. The first of these, discriminant function 1 had 96.0% amount of information therefore we looked at the canonical discriminant function coefficient for this discriminant function 1. Awareness with a high level of positivity in standardized canonical coefficients of discriminant function 1 was (3), (7), (14), (20) and (21). These types of awareness were skills in the operation of computers, understanding of knowledge, explanation, revision and pursuit of objects. Types of awareness with large negative canonical discriminant function coefficients were (22), (6) and (13). These were Skills in executing the plan and expression when creating the slides. These types of awareness contribute greatly to discrimination.

4.6.2 Important Group Awareness Categories

In Fisher’s classification function, the average elongation in awareness in student group S1 summarized in the previous section was lower than the average of all types of awareness and there were no important categories. In addition, average elongation in awareness was 0.42. Consequently, awareness among students of group S1 did not improve very much compared to other groups overall. The same results as in section 4.8 were obtained here.

Average elongation in awareness in student group S2 was higher than the total average in twelve categories ((3), (4), (5), (6), (7), (17), (18), (19), (20), (23), (24) and (25)) in awareness group G1. The group G1 of skills in communication, learning, thinking, setting tasks, revision and improvement in student group S2 showed overall improvement. All nine categories in awareness groups G2, G3, G4 and G5 had higher levels than the total

average. Average elongation in awareness in group S2 was 1.64. Consequently, Skills in expressing thoughts and explaining, Interest in and understanding of computers and Interest in the field, and skills in collecting and organizing information were important in discriminating between the student groups. This group S2 improved these skills. Group S2 was the student group in which awareness improved most.

Average elongation in awareness in student group S3 was higher than the total average in twelve categories ((3), (4), (5), (6), (7), (8), (18), (21), (26), (27), (28) and (29)) in awareness group G1. The group G1 of Skills in communication, learning, thinking, setting tasks, revision and improvement in student group S2 showed overall improvement. Three of the four categories in awareness group G2, both of the categories in G3 and both of the categories in G5 were higher than total average. Average elongation in awareness of group S3 was 1.60. Consequently, Skills in expressing thoughts and explaining, Interest in and understanding of computers and Skills in collecting and organizing information were important in discriminating between the student groups. This group S3 improved these skills.

Average elongation in awareness in student group S4 was higher than the total average for all categories in awareness group G1 except category (6). This student group improved overall in the group G1 of Skills in communication, learning, thinking, setting tasks, revision and improvement. Two of the four categories in awareness group G2, both of the categories in G3, the single category in G4 and both of the categories in G5 were higher than total average. Average elongation in awareness of group S4 was 1.47. Consequently, Skills in expressing thoughts and explaining, Interest in and understanding of computers, Interest in the field and Skills in collecting and organizing information were important in discriminating between the student groups. This student group improved these skills.

#### *4.7 Change of Awareness Related to Abilities Peculiar to This Class*

In this study, the aim was to improve an ability to express so that a person understands to be plain by reviewing slides, an ability to press-agent a product so as to let a person mind to buy it, and an ability to propose to back up the product developed in-house. The nine grades were used for evaluation of an ability peculiar to the classes as described in section 6.3.

Average assessment values for the 8 categories of awareness relating to abilities in pre- and post-class showed a significance level of 0.1 as a result of paired statistical significance tests ( $t(279)=16.6^{***}$ ,  $p<0.001$ ). Overall, it was demonstrated that students felt improvements in awareness relating to abilities peculiar in this class.

The results in paired statistical significance in pre- and post- class average values assessed for each category for awareness relating to abilities showed statistical significance in all 8 categories. It was understood from this that students felt that all awareness relating to abilities peculiar to the class had improved. It was understood that awareness related to ability to express, ability to plan to press-agent, and ability to suggest to improve a product improved in the class.

The results in Table 13 show that "(31) Ability to understand for the product introduced, (32) Ability to introduce a product, and (33) Ability to express" improved. Students created product introduce slides by considering where in which slide images are put and how they are explained to be easy to understand, what kind of animation is attractive or how the narration is spoke is easy to understand. Therefore it is supposed that "(31) Ability to understand for the product introduced" rose and that "(32) Ability to introduce a product" rose. In addition, it is supposed that to express so that a person understand to be plain by reviewing slides was realized on the awareness.

The results in Table 13 show that "(34) Ability to suggest" improved. Therefore, it is thought that "to propose to back up the product developed in-house," that is, one of the objectives in these classes, was realized.

The results in Table 13 show that "(35) Ability to plan, (36) Ability to press-agent, and (37) Ability to let a person want to purchase a product" improved. Students felt that (31) Ability to understand for the product introduced and (32) Ability to introduce a product brought improvement of (35) Ability to plan. Students felt that "(36) Ability to press-agent and (37) Ability to let a person want to purchase a product" improved because students could explain so that other students who review product introduction slides could understand to be plain as described above. Therefore, it is supposed that to express so that an ability to press-agent a product so as to let a person mind to buy it was realized on the awareness.

The results in Table 10 show that "(38) Ability to complete a work" improved and "(22) Ability to execute" in the section 6.3 also improved. These facts mean that students are able to accomplish various works.

Table 10. Statistical significance test results for awareness related to abilities peculiar to this class

Attitude Related to Ability Peculiar to This Class	Before		After		Elongation		t-Test	
	m	SD	m	SD	m	SD	t	p
(31)Ability to understand for the product introduced	4.6	1.6	6.2	1.8	1.6	1.2	7.8	***
(32)Ability to introduce a product	3.9	1.4	5.7	1.9	1.7	1.1	8.4	***
(33)Ability to express	3.8	1.5	5.3	1.7	1.4	1.3	6.2	***
(34)Ability to suggest	3.7	1.6	4.9	1.7	1.2	1.3	5.5	***
(35)Ability to plan	3.7	1.6	5.0	1.8	1.3	1.4	5.1	***
(36)Ability to press-agent	3.4	1.5	4.9	2.0	1.5	1.9	4.5	***
(37)Ability to let a person want to purchase a product	3.6	1.5	5.0	1.7	1.5	1.3	6.5	***
(38)Ability to complete a work	4.8	1.6	5.9	1.8	1.1	1.4	4.6	***
Average	4.0	1.5	5.4	1.8	1.4	1.4	16.6	***

\*\*\* p&lt;.001

## 5. Discussion

### 5.1 Characteristic of This Practice

Sheets on which to fill in explanatory texts and pictures were distributed in advance and time to create was saved by having students fill in these sheets before the class began. Once the students had decided on the product they want to present, they researched the products offered by the manufacturer in question, looked for images and pasted this into the appropriate slides. It was expected that targeting specific products would have the effect of making it easier for students to complete the project.

Methods to create product presentation slides in PowerPoint make it easy to replace images and audio so an advantage was that these slides were easy to revise. It was possible to express the slides in many different ways using PowerPoint auto-shapes or graphs as well as Smart Art.

It was easy to create dynamic explanatory slides using the animation function. Viewing was made easy by creating a narration of the points to be presented and recording this to make a slide show that, once it starts, automatically runs through all the slides to the end.

By presenting a product with six slides in less than two minutes, it was considered that it would be possible to train students to summarize product details in a concise manner. It is possible to have students understand the importance of accurate knowledge of the details of the target when doing something by researching product details and writing about them in an accurate manner. As explained in section 5.2, PowerPoint slides were limited to six and the narration time limit was set at two minutes with the average time taken at approximately 1.9 minutes, most projects were close to the time limit. Viewing time and time taken for evaluation by others combined was approximately 90 minutes. This slightly exceeded class time, therefore it is necessary to provide guidance in the future to ensure that the two-minute narration limit is not exceeded.

It was considered that it is possible to teach students to consider when planning by inserting advertising, proposals and comparisons with competing products into the slides. In reality, there was significant improvement in awareness (6) planning skills, therefore the above seems to have been achieved.

Completed projects were viewed and mutually evaluated. Evaluation by others was incorporated and it was possible for students to see how others evaluated their work. Through this student learning became a mutual, interactive activity. In addition, it can be expected that the student's own project will become a mirror, they will view other students' projects and learn from others with the effect of making them realize what needs to be revised in their own project. Furthermore, the effects of looking at evaluation by others, understanding how a project has been evaluated, incorporating this evaluation and having students notice the good and bad points in their projects and the effect of easy revision can be expected. Through this continuous active participation, active learning that cultivates independent thinking skills was achieved.

Time taken from surveys, creation of slides and creation of reports in order to complete the project was 19.8 hours on average. Time taken from surveys, creation of slides and creation of reports was approximately 1, 3 and 1 hours respectively giving a total of approximately 5 hours of class time. Therefore, approximately 15 hours of activities or work were performed outside of class. It can be said that positive learning effects were obtained through a fair amount of study outside of class.

### 5.2 Changes in Awareness Relating to Skills and the Reasons for These Changes

As explained in section 4.3, all awareness relating to skills categories (1) - (30) were acknowledged to have significant difference. The reason for enhanced awareness was as follows: by actively involving students in

many different interactive activities during and outside of classes, it is considered that it was possible to enhance various skills.

### *5.3 Classification of Students through Principal Component Analysis of Awareness*

Cluster analysis of elongation in average assessment values was conducted with the principal component score found in section 4.4 as variables and the 27 students who were the targets of analysis were divided into four clusters (Groups S1 – S4) as explained in section 4.5.

The results of analysis of variance and multiple comparison of the four groups for elongation in awareness showed the relationship of  $S2=S3=S4>S1$ . From this it was understood that elongation levels were lower only in group S1 and that elongation levels in group S1 were the lowest. There were a number of differences between S2, S3 and S4 in the five awareness groups G1 – G5, however, there was no significant difference between them overall. From this it is considered that it is necessary to devise methods to improve awareness for S1 more than other groups to increase the current levels of improvement for its 14 students. In order to do this it was suggested that it was necessary to investigate changing the guidance methods used for other groups.

### *5.4 Important Group Categories*

As explained in section 4.6, through discriminant analysis, it was discovered that the average elongation in awareness in student group S1 was low, there were no important categories and there was not much improvement compared to other groups generally. The results of analysis in section 4.5 and 4.6 were the same ones.

The results in section 4.5 showed marked improvement in student group S2 for awareness group G2 “Skills in expressing thoughts and explaining.” Student group S3 showed marked improvement in awareness groups G3 “Interest in and understanding of computers” and G5 “Skills in collecting and organizing information.” Student group S4 showed medium levels of improvement in almost all awareness groups. In this way, three student groups have distinctive characteristics.

Average elongation in awareness in student group S2 was higher than the total average in 12 categories in awareness group G1 and nine categories of the G2, G3, G4 and G5. Average elongation improvement in awareness in student group S3 was higher than the total average in 12 categories in awareness group G1, 3 categories in G2, 2 categories in G3 and 2 categories in G5. Average elongation improvement in awareness in student group S4 was higher than the total average in 11 categories in awareness group G1, 2 categories in G2, 2 categories in G3, 1 category in G4 and 2 categories in G5. By using discriminant analysis in this way, it was discovered that there was not much difference in the average elongation in awareness in the three student groups S2, S3 and S4.

## **6. Conclusion**

Classes to create product presentation slides using PowerPoint were designed and held by incorporating active learning. Students determined the product they just wanted to present, researched this product, thought about how to explain the project, created slides, inserted animation and recorded narration. All students viewed each other’s slides and learned from each other. Mutual evaluation was conducted and comments were made. Following this, slides were revised and all students mutually viewed and evaluated the slides again. Students mutually interacted and cooperated with other students. By actively participating in the evaluation and revision activities in the process of completing their projects, classroom practice that cultivated expressiveness, planning ability, ability to make proposals and so on was reported.

The findings in this practice can be explained as follows.

- (1) Total time taken for surveys of explanations and creation of slides, the creation of product presentation slides and the creation of reports was 19.8 hours on average.
- (2) Total narration time for projects was 115.2 seconds on average.
- (3) Assessment values for awareness relating to skills were felt to have improved overall.
- (4) Statistical significance tests for each category for awareness relating to skills showed awareness in all 30 categories was felt to have improved.
- (5) Principal component analysis was performed for elongation in assessment values for awareness and cluster analysis was conducted using the principal component score. The dendrogram obtained showed that students were divided into four groups S1 – S4. Cluster analysis was conducted on elongation in assessment values for awareness and awareness was divided into five groups G1 – G5. Next, using analysis of variance and

discriminant analysis, awareness of student group S1 did not improve much overall in comparison to other groups and had the lowest level of elongation. Awareness of student group S2 showed marked improvement in awareness group G2 skills in expressing thoughts and explaining. Awareness of student group S3 showed marked improvement in awareness groups G3 Interest in and understanding of computers and G5 skills in gathering and organizing information. Awareness of student group S4 showed medium levels of elongation in almost all awareness groups.

(6) Statistical significance tests for each category for awareness related to abilities peculiar to this class showed awareness in all 8 categories was felt to have improved. This practice raises expressiveness, planning ability and ability to make proposals.

In the future, we would like to reveal useful activities in improving attitude in class by analyzing the post survey of attitude. In addition, we would like to compare the effects of the above-mentioned Storytelling [Miyaji 2010] and the effects of this class. We would also like to apply innovation to class methods to improve learning ability for students with a wide range of learning abilities.

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