Comparison of Awareness and Computer Literacy in Classes through Creation of Storytelling and Product Introduction Slides

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ABSTRACT

In order to ensure that university students have a sound base of computer knowledge and operating ability, and in order to improve their awareness related to their abilities, two types of classes were offered in which storytelling and product slide presentations were performed by creating slides using PowerPoint, entering awareness and evaluations by others using Excel, and creating and submitting reports using Word. This paper investigates differences in the outcomes resulting from differences in the themes, and explores potential reasons for these differences. It compares and examines the amount of time taken to complete the works and the awareness of the students with regard to these abilities. Their abilities to use software functions are surveyed and differences between two classes are compared and revealed. After comparing usage abilities of individual software functions, the results of variance analysis of the average usage ability for each of the three types of software for two classes are shown.

Keywords: Storytelling, Product presentation, Slide creation, Awareness related to abilities, Computer literacy, Higher education.

Highlights of this paper

- This paper investigates differences in the outcomes resulting from differences in the themes, and explores potential reasons for these differences.
- It compares and examines the amount of time taken to complete the works and the awareness of the students with regard to these abilities.

1. INTRODUCTION

Instructional design plays important roles to realize the charming, effective and efficient class (Gagne *et al.*, 2005). Before a class, we need to consider which media should be used, how they should be utilized, and when and where they should be handled. Many new class methods have been proposed and many attempts have been made to provide effective classes (Miho *et al.*, 2016); (Tsuji and Sugiyama, 2016). Recently, the Central Education Council has pointed out the need for a shift to active learning, in which students take the lead in identifying problems and discovering their solutions (Japan Ministry of Education Culture Sports Science and Technology Council, 2012). It has presented its findings on the implementation of active learning aimed at providing high quality undergraduate education which promotes student-led learning, providing multiple experiences with active learning, and cultivating lifelong learning skills. It is believed that problem-solving abilities can be developed through the task of creating objects that people desire through the creation of articles that people actually use.

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 *et al.*, 2010). From a good long time ago, storytelling has served as a popular education tool, utilised to pass knowledge from one generation to another. Storytelling is a powerful pedagogical approach that can be used to enhance learning outcomes for general, scientific and technical education (Sharda, 2007). Technological advances, such as digital cameras, editing software and authoring tools, have increased the use of technology in the classroom to help students in constructing their own knowledge and ideas to present and share them more effectively (Standley, 2003).

In this way, storytelling is used various fields of education and helps in a large variety of scenes. Recently digital storytelling is a powerful tool to integrate instructional messages with learning activities to create more engaging and exciting learning environments. There the following examples: using storytelling to motivating programming (Kelleher and Pausch, 2007) utilising storytelling for language learning as a practical and powerful teaching tool (Tsou *et al.*, 2006) encouraging meaningful teacher reflection using digital storytelling (Renda, 2010) helping teachers use technology in their classrooms effectively (Robin, 2008).

The object in comparison with the class to create storytelling is the following class. A class to create slides to present products was implemented using PowerPoint. This aim was not only to enhance PowerPoint skills, but also to improve expressiveness, planning ability and ability to make proposals (Miyaji, 2016). 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 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.

During a three hour per week mandatory information course was held during the second semester for third year university students, a "storytelling creation" course (hereinafter referred to as "ST"), students used PowerPoint to reflect on themselves and create a work about themselves, with the aim of improving their self-understanding, expressive capabilities, and problem-solving abilities. The process of creating these works included evaluation and

correction activities, and it was reported that through this the students developed their problem-solving abilities (Miyaji, 2010).

During a two hour per week mandatory information course was held during the second semester for third year university students, a "product and book introduction slide creation" course (hereinafter referred to as "PI"), students used PowerPoint to create slides introducing products and books in which they had a personal interest, with the aim of improving their research, planning, publicity, and proposal abilities. It was reported that, through this process, they were able to improve not only their PowerPoint operating skills, but also their expressive abilities, planning abilities, publicity skills, and their proposal skills for improving products developed within their own companies (Miyaji, 2017).

These consisted of active learning, creating works which could only be produced through active and student-led effort. These classes focused on providing students with practical knowledge and applied knowledge. Both classes shared in common the creation of slides using PowerPoint. The themes of the two classes were improving self-understanding and improving project planning and publicity abilities. There have been no reports comparing the effects of these different themes, so we sought to compare the themes and discover what differences there were in the skill and awareness improvements between the projects. About the classes of two different subjects of the same lecture course design, the study that compares term recognition, awareness, and the useful activity is not yet done. In addition, it is not yet examined whether the same learning effect is provided when a similar subject based on the same lecture course design is carried out.

This paper explains the contents of the classes, of the works themselves, and of the studies, analyzes the information of the studies, compares the results and presents conclusions.

2. CONTENTS OF CLASSES

2.1. Class Objectives

The objectives of the two classes were for students to directly use computers to provide them with a firm mastery of what they learned regarding computers and enable them to use that knowledge.

For ST, in order to gain a greater understanding of themselves, the students reflected on their past and thought about their current interests and concerns, deliberated about what they wished to do, and organized the results in the form of six slides. For PI, the students decided on products they were interested in and created six slides introducing the product contents, features, key points of interest, advertising, positions with relation to competitors, and improvement proposals.

The students needed to think about the themes provided, carry out investigations, and decide on tasks. During this process, the students had to gather information and organize related information and data.

For ST, in order to promote self-understanding, the students had to provide explanations concerning themselves, structured in a format such as "introduction, preliminaries, hobby, leveraging the hobby, future objectives, and conclusion." In the lead up to their job search activities, this project had them analyze themselves and identify what they wanted to do, where their abilities lied, and what they were interested in.

For PI, the students explained their project in a format such as "product name, product contents, product features, advertising, positions with relation to competitors, and improvement proposals," to provide them with an understanding of corporate activities such as research, planning, development, and publicity. The objective of this project was to develop their ability to identify issues, their publicity skills, used in stimulating purchasing desire for the products they develop, and their proposal skills for improving products developed by their companies.

For both of the projects, students were to add movement to their slides in the form of animation to make the content clearer. Students thought about the contents of their explanations in order to record a slide narration, creating audiovisual slides.

When creating slides, it was important that the slides were visually easily understandable, and for the researched contents to be explained in an easy to understand manner. The project also made students think about how to arrange images and photographs related to the content, and how to present them. Students learned the importance of thinking about how to use explanations, images, animation, narration, and the like, in appropriate places, to communicate their ideas and thoughts to others and have the viewers of the slides understand this content. This process developed the students' abilities to express themselves in writing and to express their explanations using images. Working under a deadline for the slides and report also developed their abilities to work systematically.

In these classes, after creating the slides, they presented them to other students, and students evaluated each other. The reactions of the students, in the form of mutual evaluations, were organized into evaluations of others for each person, and each student was provided with the evaluations others had made of them. Each student looked at the evaluations other students had made of their works, and revised their works based on them. This mutual presentation and mutual evaluation activity promoted mutual study and collaborative learning between students. They also developed their listening abilities and their abilities to make revisions and improvements. By introducing evaluation activities into the article creation activity of making slides, the classes improved students' awareness regarding the skills necessary for problem-solving and cultivated their active thinking abilities.

The two classes were laboratory classes, so students were required to create a report. Students entered the necessary information into a report framework and learned how to write technical documents. Students submitted the report to an instructor who read them and pointed out items requiring revision or correction. Through this, students learned how to create more appropriate reports. Furthermore, through their report writing activities, students also cultivated their written and non-written expressive abilities.

This process has high potential for teaching them how to operate computers by creating slides and writing reports, fostering a greater interest in and understanding of computers, and broadening their usage capabilities.

2.2. Class Contents and Plan

The two classes were information courses with the content shown in Table 1. They were mandatory lab classes taught in the second semester for third year students of University A's Information Science Department. In these classes, each student created two works. Viewing and evaluation were performed two times each, and revisions were performed once each. The class times, number of students, and number of sessions per theme differed, as shown in Table 1. There were two ST themes: self-understanding and the writing of a story for children. There were also two PI themes: the introduction of a product and the introduction of a book.

The plan in Table 2 was used to carry out the two classes. During the first class, survey sheets were distributed and an awareness study was conducted. Experiment documents were distributed, and, based on them, explanations were provided of the project tasks, class objectives, contents, plans, slide creation methods, experiment methods, and the like. Two sheets of A4 paper were handed out for students to write the content they wished to present. Students were told to think about the contents before the second session, write them on the right side of the paper, and draw a picture in the rectangle at left. Students were then directed to look up information necessary for the creation of their works, and to think about the contents of their projects.

At the second session, narration recording methods and animation insertion methods were explained, and students created slides. An explanation was then provided of how to write up the report. In the following week and thereafter students inserted animations, recorded narration, and completed their slides. At the end, they submitted files containing those slides.

The instructor collected and gathered all the files into a single file, and inserted a slide in between each work requesting that students perform an evaluation. During the last two classes time was allotted for students to view each other's works and evaluation each other. At the start of the class evaluation forms for evaluating other student's works were handed out, works were shown on the screen, and students watched and evaluated each work. When all works had ended, students entered their evaluations in the evaluation sheets. These evaluation sheet files were then submitted. Evaluation sheets from other students were collected for each work, and students could download all of the evaluations of their works. Students used these evaluations of their works to make revisions. The following week they saw the revised slide presentations and evaluated them again, submitting evaluation sheets.

Before each class during which works were evaluated, students submitted 1/3 of their reports. These were returned during class, with areas requiring revision pointed out. The final reports were written before the session following the session in which the works were re-evaluated, and all worksheets in evaluation sheet were entered and submitted.

Table-1. Comparison of contents of classes.

Subject conents	Storytelling (ST)	Product introduction (PI)
Subject kinds	Information subject	Information subject
Class type	Experiment	Experiment
Start year	The latter period in the third year	The latter period in the third year
Classroom hours/time	180 min.	90 min.
No. of classroom times	15	15
No. of attendance students	31	26
No. of times/theme	4	6

Source: Miyaji (2010).

2.3. Contents of Created Works

Each of the works consisted of six slides, with presentations to be completed within two minutes.

2.3.1. ST Themes

2.3.1.1. Self-Understanding

This theme was selected to provide students with a greater understanding of themselves so that they could clarify what jobs they would wish to do and which companies they would wish to apply for, assisting them with their preparations for job-seeking. In this project, students analyzed and scrutinized themselves and discussed their personality, what they enjoyed, what their hobbies were, what kind of careers they wanted, what they wanted to do in the future, what they wished to learn, and the like.

Sample titles: "What am I?" "My Childhood Dreams and My Current Dreams" "My Personality" "My Educational History" "My Interests" "My Life in My Hobbies" etc.

2.3.1.2. Stories for Children

This theme was selected to raise awareness of working for others. Students wrote stories based on consideration of what kinds of stories children in lower elementary school grades would enjoy, what stories would

benefit them, and what kinds of dreams children like to hear about. Students were not allowed to use existing fairy tales.

Sample titles: "Fairy Tale Nation" "A Dog's Adventure" "The Story of the Spider Child" "The Lives of Japanese Insects" "A Fun Space Voyage" "The Underground World" etc.

Table-2. Class plan.

	Storytelling (ST)			Product introduction (PI)	
Time	Works	Plan related to assignment	Time	Works	Plan related to assignment
1	First work	Problem description, information retrieval, considering story about their current interests and concerns, inputing evaluation sheet 1.	1		Problem description, information retrieval, considering the description to introduce, inputing evaluation sheet 1.
2		Explaining how to write a report, submission of the entry form, creating slide.	2	First work	Explaining how to write a report, submission of the entry form, creating slide.
3		Creating slide, putting the narration, writing report.	3		Creating slide, putting the animation.
4		Mutual evaluation, inputting evaluation sheet 2, modifying slide, writing report 2.	4		Creating slide, recording narration, writing report 1.
5		Mutual evaluation, inputting evaluation sheet 3, writing report 3.	5		Mutual evaluation, inputting evaluation sheet 2, modifying slide, writing report 2.
6	Second work	Submission of the entry form, information retrieval, creating slide.	6		Mutual evaluation, inputting evaluation sheet 3, writing report 3.
7		Creating slide, adding animation.	7		Completing report and evaluation sheet.
8		Creating slide, recording narration, writing report 1.	8	Second work	Submission of the entry form, creating slide.
9		Mutual evaluation, inputting evaluation sheet 2, modifying slide, writing report 2.	9		Creating slide, putting the animation.
10		Mutual evaluation, inputting evaluation sheet 3, writing report 3.	10		Creating slide, recording narration, writing report 1.
11	Third work	Submission of the entry form, information retrieval, creating slide.	11		Mutual evaluation, inputting evaluation sheet 2, modifying slide, writing report 2.
12		Creating slide, adding animation, recording narration	12		Mutual evaluation, inputting evaluation sheet 3, writing report 3.
13		Mutual evaluation, inputting evaluation sheet, writing report.	13		Completing report and evaluation sheet.
14		Revising and submiting report and evaluation sheet.	14		Revising and submiting report and evaluation sheet.
15		Repeating a correction and submission until a report and an evaluation sheet are completed.	15		Repeating a correction and submission until a report and an evaluation sheet are completed.

Source: Miyaji (2010).

2.3.2. PI Themes

2.3.2.1. Product Introductions

The objective of this theme was to have students think about how to stimulate purchase interest for products such as electronic and industrial products, to introduce products they were interested in or wanted to recommend, and to stimulate purchase desire for those products. This theme envisioned planning for future product development, and had students investigate products, plan improvements, and provide product publicity. Students

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had to choose products and include images of them. Games were not permitted. The slides were to be structured as follows:

1. Product name and catchphrase.
2. Product contents (product name, company name, product contents, model number, release date, nature of product, etc.).
3. Product features and what the student liked about the product (product functions, useful aspects of product, product qualities, etc.).
4. Advertisement (advertisement to be run in a newspaper or magazine, flier, etc.).
5. Position relative to competitors (company name, product name, specifications, price, sales volume, market share, competitor information, key points, etc.).
6. Improvement proposals (inconvenient aspects of product, functions to be added, etc.).

2.3.2.2. Book introduction

Students were to introduce a book and foster a desire in others to read the book. Students were to introduce books that move them, that they found interesting, that they found useful, etc. An image of the cover of the book was required to be included in a slide. Books which were primarily visual (comics, photo collections, picture books, etc.) were not allowed.

1. Book name and catchphrase.
2. Contents of book (author, title, year of publication, place of publication, size of book, number of pages, price, etc.).
3. Overview of book (plot).
4. Reasons for recommending the book (areas of interest, reasons for recommendation , parts of the book that stood out, etc.).
5. Key points when reading (moving scenes, interesting scenes, etc.).
6. Introduction of related books (by introducing related books, students would introduce books which would stimulate desire to read the recommended book).

3. STUDY CONTENTS

3.1. Awareness Survey

Before creating slides and after completing their presentations, students indicated their awareness regarding thirty strengths on a scale of 1 to 9. 1. None, 3. Some, 5. A large amount/degree, 7. A very large amount/degree, 9. An extremely large amount/degree. When evaluation values were entered in the Excel worksheet following the presentations, the pre-presentation score was subtracted from the post-presentation score, and the resulting change values were indicated and plotted on a graph. Students copied this as an image and attached it to the report in the indicated area.

Significant differences for the amount of difference between pre- and post-presentation awareness scores for each item were calculated, and it was determined which awareness were increased by a significant degree. These changes were used to determine the degree to which the classes achieved their objectives.

3.2. Usage Ability Study

This study was conducted to determine to what degree students were capable of using PowerPoint, Word, and Excel software functions. The study covered 25 PowerPoint functions, 17 Word functions, and 18 Excel functions,

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for a total of 60 functions. Students indicated their ability to use each of these functions (operation skill levels) in each class on a scale of 1 to 5, entering the corresponding number. 5. Extremely skilled in using the function, 4. Skilled in using the function, 3. Able to use the function, 2. Limited ability to use the function, 1. Unable to use the function (not aware of function).

Significant differences for the amount of difference between pre- and post-presentation usage ability scores for each item were calculated, and it was determined which usage abilities were increased by a significant degree.

4. ANALYSIS RESULTS

We believe that one of the essentials of study is securing sufficient time, so we investigated and considered the time involved in class activities, indicated on the covers of reports. There were 31 ST respondents and 26 PI respondents. We examined students' awareness regarding their abilities, both before and after presentations, and used the increase in post-presentation scores vs. pre-presentation scores to determine the degree to which the class achieved its objectives. We examined students' software usage abilities, both before and after presentations, and used the increase in post-presentation scores vs. pre-presentation scores to determine the degree to which the class improved students' computer literacy. We analyzed the results of evaluations of other students' presentations, after seeing each presentation twice, and used the differences in the scores to determine the degree to which the presentations were revised.

We carried out classes for the three ST themes for 3 themes x 5 weeks x 3 hours = 45 hours, and for the two PI themes for 2 themes x 7.5 weeks x 22.5 hours. To compare ST and PI, we used two of the ST themes. Below is a comparison of ST and PI works 1 and 2. In the significant difference verification a significance level of 5% was considered a significant difference. The symbols m, SD, t, and p indicate "mean," "standard deviation," "test statistic," and "significance probability." Significance levels of 0.1%, 1%, 5%, and 10% are indicated as ***, **, *, and +, respectively.

4.1. Comparison of Each Kinds of Required Time

On the covers of reports, students entered the total time taken to investigate in order to create explanations and slides, to create the slide presentations themselves, and to write their reports. These were tabulated, and the mean times and standard variations are indicated in Table 3.

For ST the mean times taken to complete each work were 22.8 hours and 23 hours. For PI the mean times were 19.3 hours and 15.8 hours. In all of these cases, approximately 5 hours were in-class hours, so the mean amounts of time worked outside of class for ST were roughly 18 hours and roughly 18 hours, and for PI were roughly 14 hours and roughly 11 hours.

For ST, there were no significant differences in the times for each type of work within each project ("three times") and the total times for each project. For PI, however, there were significant differences in investigation times and the total times between projects.

Analysis of significant differences between the three times and the total times for the ST and PI projects found a significant difference in slide creation time for the first work, with a longer time for the ST project. For the second work, as well, significant differences were found in the investigation times, slide presentation creation times, and total times, with longer times for the ST project. For both the first and second works, slide presentation creation times took longer for ST than PI.

Table-3. Time taken for each part of class (hours) and results of significant difference test.

Class contents	Kind of required time	First work		Second work		Difference		t-test	
		m	SD	m	SD	m	SD	t value	p
ST (N=31)	Collecting information	5.8	4.9	6.2	5.0	-0.4	5.9	0.3	
	Creating slides	9.0	4.5	9.0	4.7	0.1	4.8	0.1	
	Writing final reports	8.0	4.1	7.9	3.2	-0.1	5.0	0.1	
	Total	22.8	10.5	23.0	10.3	-0.2	11.7	0.1	
PI (N=26)	Collecting information	5.1	2.7	3.3	2.1	1.7	2.1	4.4	***
	Creating slides	6.8	2.8	5.8	2.9	1.0	3.1	1.6	
	Writing final reports	7.4	3.2	6.7	2.9	0.8	2.8	1.4	
	Total	19.3	5.7	15.8	5.7	3.5	4.9	3.7	***
t-test	Collecting information	0.7		2.6	*	1.7	+		
	Creating slides	2.2	*	3.0	**	0.8			
	Writing final reports	0.5		1.5		0.7			
	Total	1.5		3.1	**	1.5			

*** p<.001, ** p<.01, * p<.05, + p<.1.

4.2. Increases in Ability-Related Awareness

With regard to students' awareness regarding the abilities indicated at the far left of Table 4, students entered evaluation scores in the evaluation sheets before and after their presentations, and submitted these sheets.

We performed variance analysis to confirm whether there were any significant differences in increases or the sums of increases for ST and PI works one and two. With regard to the average overall increase in ability-related awareness for all 30 items, variance analysis found a significant difference with a significance level of 0.1% ($F_{(3,1710)}$ = 19.4***, p<0.001). Multiple comparison also found significant differences in increases between ST works one and two. Based on this, we determined that overall ST ability-related awareness growth was greater for work one and smaller for work two. No overall differences were found in ability-related awareness growth for PI works one and two.

Variance analysis of growth in mean evaluation scores for each ST ability-related awareness item found that there were significant differences for all 30 items. Multiple comparison found significant differences in for 21 items between ST works one and two. A significant difference was recognized in increases to "(4) Breadth of computer usage methods and usage scenarios" for ST and PI work two. A significant difference was recognized in the increase in "(24) Satisfaction" between works one and two for both the ST and PI works. A significant difference was recognized in the increase in "(15) Presentation abilities" between PI works one and two. No other significant differences were found. Based on this, we determined that overall ST ability-related awareness growth for many items was greater for work one and smaller for work two. We also found that there were almost no differences in awareness between PI works one and two. We also found that there were almost no differences between the growth rates for ST and PI works one and two.

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Table-4. Results in analysis of variance and multiple comparison for elongation of awareness related to ability.

Awareness related to ability	Storytelling (ST)						Product introduction (PI)						Results in analysis of variance						Results in multiple comparison				
	Work S1		Work S2		Work S1+S2		Work P1		Work P2		Work P1+P2		Sum of square		Mean square		F-ratio	p	S1-S2	S1-P1	S2-P2	S12-P12	P1-P2
	Elongation		Elongation		Elongation		Elongation		Elongation		Elongation		Condition	Error	Condition	Error							
	m	SD	m	SD	m	SD	m	SD	m	SD	m	SD											
(1) Interest in and curiosity about computers.	1.6	1.3	0.4	1.1	2.0	1.7	0.9	1.2	1.0	1.0	1.9	1.6	60.9	321.6	12.2	1.9	6.2	***	**				
(2) Understanding of computers.	2.1	1.3	0.4	1.1	2.4	1.2	1.3	1.5	1.0	1.8	2.4	1.6	102.6	351.3	20.5	2.1	9.6	***	***				
(3) Computer operation skills.	1.6	1.0	0.4	0.9	2.0	1.2	1.3	1.0	0.6	1.0	1.9	1.4	64.4	209.8	12.9	1.3	10.1	***	***				
(4) Computer usage methods and broadening of situations.	1.1	0.9	0.1	0.7	1.2	0.8	1.0	0.9	1.0	0.9	1.9	1.2	46.9	146.5	9.4	0.9	10.6	***	**		*	+	
(5) Ability to set challenges, ability to discover problems.	1.5	1.2	0.3	1.1	1.8	1.0	1.1	0.9	0.7	0.9	1.8	1.1	54.9	185.8	11.0	1.1	9.7	***	***				
(6) Ability to plan, to do things in a planned manner.	1.0	1.2	0.6	0.8	1.7	1.3	1.2	1.2	0.7	1.4	1.8	1.5	35.2	267.8	7.0	1.6	4.3	**					
(7) Cultivation of understanding of knowledge learned.	1.7	1.0	0.2	1.1	1.8	1.4	1.3	1.3	0.4	1.2	1.8	1.7	76.8	280.6	15.4	1.7	9.0	***	***				
(8) Ability to study by oneself, ability to learn.	1.5	1.2	0.2	1.0	1.7	1.1	1.0	1.2	0.8	1.5	1.8	1.9	53.4	306.5	10.7	1.9	5.7	***	**				
(9) Ability to gather information, ability to conduct research.	1.0	0.9	0.3	1.1	1.3	1.2	1.3	1.6	0.5	1.4	1.8	2.0	42.2	334.2	8.4	2.0	4.2	**					
(10) Ability to sort through related information or data.	1.9	1.4	0.2	1.2	2.2	1.6	1.3	1.3	0.5	1.2	1.9	1.6	93.0	333.8	18.6	2.0	9.2	***	***				
(11) Ability to analyse information.	1.3	1.3	0.4	0.6	1.7	1.3	0.8	0.8	0.4	1.2	1.3	1.4	39.5	220.5	7.9	1.3	5.9	***	*				
(12) Ability to	1.7	1.2	0.3	1.0	2.0	1.3	1.2	1.0	0.4	0.7	1.7	1.1	77.9	200.7	15.6	1.2	12.8	***	***				+

express thoughts in writing.																				
(13) Ability to express thoughts through media other than writing.	1.8	1.4	0.2	1.0	1.9	1.5	1.3	1.3	0.7	1.4	2.0	1.3	81.4	293.7	16.3	1.8	9.1	***	***	
(14) Ability to speak and explain things to others in an easy-to-understand manner.	1.8	1.2	0.2	1.1	1.9	1.1	1.3	1.1	0.7	1.3	2.0	1.3	81.3	240.5	16.3	1.5	11.2	***	***	
(15) Ability to make presentations.	1.6	1.2	0.5	1.0	2.1	1.4	1.4	1.2	0.3	1.3	1.7	1.3	72.5	269.3	14.5	1.6	8.9	***	*	*
(16) Ability to listen to what people are saying and ability to ask people questions.	1.1	1.2	0.5	1.2	1.6	1.6	0.7	0.9	0.5	1.2	1.3	1.3	29.6	269.7	5.9	1.6	3.6	**		
(17) Communication ability.	1.0	1.0	0.4	1.0	1.4	1.4	0.7	0.8	0.7	1.4	1.4	1.7	25.2	266.6	5.0	1.6	3.1	*		
(18) Ability to appropriately self-evaluate one's thoughts.	1.3	1.2	0.4	1.0	1.7	1.2	1.0	1.1	0.5	1.3	1.4	1.2	42.7	230.4	8.5	1.4	6.1	***	*	
(19) Ability to appropriately evaluate other people's thoughts.	1.1	1.1	0.4	1.0	1.5	1.4	0.7	1.1	0.4	0.9	1.2	1.2	27.9	223.4	5.6	1.4	4.1	**		
(20) Ability to correct and improve on one's own thoughts.	1.4	1.1	0.1	1.0	1.5	1.4	0.8	1.0	0.6	0.9	1.4	1.2	45.4	218.1	9.1	1.3	6.9	***	***	
(21) Ability to pursue matters deeply, ability to explore matters.	1.5	1.2	0.4	1.2	1.9	1.5	0.7	0.9	0.7	1.2	1.4	1.2	53.2	253.3	10.6	1.5	6.9	***	**	
(22) Ability to execute, ability to practice, ability to put into action.	1.5	1.1	0.2	1.2	1.7	1.3	0.7	0.9	0.8	1.2	1.5	1.6	52.4	259.1	10.5	1.6	6.7	***	**	
(23) Ability to cooperate with	1.4	1.6	0.4	0.9	1.8	1.8	0.7	1.3	0.3	1.6	1.0	2.0	53.6	410.7	10.7	2.5	4.3	**	+	

others, ability to study in cooperation with others.																					
(24) Sense of accomplishment, sense of satisfaction.	2.0	1.4	0.7	1.0	2.6	1.5	1.0	1.2	0.5	1.4	1.5	1.8	101.3	339.0	20.3	2.1	9.9	***	**	+	*
(25) Sense of fulfilment, sense of achievement.	1.8	1.3	1.0	1.2	2.7	1.3	0.8	1.1	0.8	1.5	1.7	1.9	81.4	336.5	16.3	2.0	8.0	***			+
(26) Ability to solve problems.	1.7	1.0	0.4	1.0	2.0	1.4	0.8	0.9	0.4	1.4	1.2	1.6	66.9	264.9	13.4	1.6	8.3	***	**		
(27) Ability to construct and create knowledge.	1.6	1.3	0.5	0.9	2.1	1.5	0.8	1.0	0.6	1.1	1.4	1.4	59.4	261.5	11.9	1.6	7.5	***	*		
(28) Ability to think, consider and come up with ideas by oneself.	1.4	1.3	0.5	1.0	2.0	1.4	1.0	1.2	0.5	1.2	1.6	1.5	49.6	275.0	9.9	1.7	6.0	***	+		
(29) Creativity/ability to create.	1.4	1.2	0.4	0.8	1.8	1.2	0.8	1.2	0.7	1.3	1.5	1.7	44.2	264.8	8.8	1.6	5.5	**	*		
(30) Interest in and curiosity about this field.	1.6	1.3	0.5	1.2	2.1	1.6	0.8	1.2	0.7	1.4	1.5	1.9	56.2	358.0	11.2	2.2	5.2	**	+		
Mean	1.5	1.2	0.4	1.0	1.9	1.4	1.0	1.1	0.6	1.3	1.6	1.6	52.2	88.7	10.4	0.5	19.4	***	***		

*** p<.001, ** p<.01, * p<.05, + p<.1

4.3. Software Function Usage Ability Growth

Software usage ability was surveyed for the 60 items shown in Table 5, both before and after the presentations. There were 31 respondents for the pre- and post-presentation surveys for ST and 26 respondents for the pre- and post-presentation surveys for PI.

Table-5. Results of significant difference test for elongation of computer literacy.

Kind	No	Functions of software	Storytelling (ST)				Product introduction (PI)				Comparison	
			m	SD	t	p	m	SD	t	p	t	p
	1	Start of PowerPoint	0.17	0.76	1.69	+	0.27	0.76	1.77	+	0.55	
	2	Role of the Window of PowerPoint	0.75	1.56	3.65	***	0.54	0.75	3.61	***	0.64	
	3	Layout of slide	0.61	1.24	3.76	***	0.67	0.46	7.34	***	0.25	
	4	The size of place holder and change of the position	0.78	1.56	3.80	***	0.54	0.63	4.24	***	0.75	
	5	The input of title and change of font size	0.47	1.06	3.40	**	0.44	0.74	3.00	**	0.14	
	6	Input of text	0.37	0.94	3.03	**	0.27	0.65	2.06	*	0.51	
	7	Saving a slide	0.20	0.88	1.76	+	0.54	0.84	3.20	***	1.62	
	8	Practice of slide show	0.10	0.86	0.90		0.46	0.97	2.38	*	1.69	+
	9	Interruption of slide show	0.27	1.07	1.93	+	0.65	1.04	3.16	**	1.52	
	10	Setting of background	0.81	1.23	5.05	***	0.48	0.95	2.54	*	1.22	
	11	Recording of the narration	2.88	1.39	15.77	***	1.73	1.35	6.43	***	3.51	***
	12	Print of distribution document	1.08	1.49	5.55	***	0.77	1.09	3.54	***	0.96	
	13	Setting of slide show	1.05	1.29	6.18	***	0.69	1.23	2.81	**	1.18	
PowerPoint	14	Setting of effect to change a screen	1.49	1.45	7.81	***	0.85	0.99	4.28	***	2.04	*
	15	Setting of animation	1.39	1.48	7.13	***	0.94	1.00	4.70	***	1.39	
	16	Method to play back repeatedly	1.66	1.53	8.29	***	1.02	0.86	5.92	***	1.99	*
	17	Setting special effects in a text	1.49	1.59	7.15	***	0.88	0.80	5.53	***	1.83	+
	18	Setting special effects to an object	1.53	1.74	6.68	***	0.79	0.83	4.73	***	2.03	*
	19	Change of animation	1.59	1.55	7.81	***	0.81	0.88	4.60	***	2.39	*
	20	Practice of animation	1.36	1.54	6.72	***	0.83	0.91	4.55	***	1.61	
	21	Change of the kind of animation	1.56	1.52	7.81	***	0.85	0.77	5.50	***	2.24	*
	22	Change of the order of animations	1.63	1.54	8.05	***	1.04	1.09	4.76	***	1.74	+
	23	Changing to distribute time of animation	1.83	1.66	8.41	***	1.02	0.92	5.51	***	2.31	*
	24	Deletion of the animation	1.36	1.58	6.53	***	0.77	1.01	3.80	***	1.72	+
	25	Setting of the trace of animation	1.90	1.70	8.48	***	0.85	1.17	3.63	***	2.83	**
	26	Role of the window of Word	0.54	1.32	3.13	**	0.27	0.59	2.27	*	1.00	
Word	27	Saving of a document	0.20	0.80	1.94	+	0.27	0.65	2.06	*	0.37	
	28	Layout of page	0.51	1.20	3.23	**	0.44	0.68	3.23	***	0.26	
	29	Setting of letter format	0.20	0.71	2.19	*	0.25	0.50	2.48	*	0.30	
	30	Change of font	0.10	0.57	1.35		0.12	0.64	0.90		0.10	

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	#	Item									
	31	Character style, a size, underline	0.14	0.81	1.27		0.19	0.68	1.41		0.31
	32	Making of table	0.20	0.95	1.63		0.27	0.71	1.90	+	0.31
	33	Insertion of table	0.41	1.09	2.84	**	0.19	0.68	1.41		0.92
	34	Drawing a ruled line	0.31	0.96	2.42	*	0.27	0.52	2.57	*	0.18
	35	Undrawing a ruled line	0.31	0.96	2.42	*	0.23	0.50	2.29	*	0.37
	36	Input of the letter	0.10	0.57	1.35		0.12	0.64	0.90		0.10
	37	Pasting up of image	0.24	0.74	2.43	*	0.23	0.58	2.00	*	0.04
	38	Print of document	0.14	0.62	1.66		0.15	0.66	1.16		0.12
	39	Print preview	0.17	0.76	1.69	+	0.00	0.55	0.00		1.01
	40	Print	0.07	0.52	1.00		0.15	0.53	1.44		0.69
	41	Pasting up of letter	0.34	0.91	2.83	**	0.21	0.56	1.90	+	0.65
	42	The number of letters in the sentence	0.47	1.34	2.69	**	0.54	0.84	3.20	***	0.22
Excel	43	Start of Excel	0.07	0.52	1.00		0.00	0.55	0.00		0.54
	44	Role of the window of Excel	0.54	1.37	3.02	**	0.33	0.66	2.46	*	0.75
	45	Making of table	0.17	0.76	1.69	+	0.17	0.54	1.61		0.02
	46	Saving a table	0.20	0.80	1.94	+	0.08	0.67	0.57		0.70
	47	Opening the saved table	0.24	0.98	1.84	+	0.08	0.38	1.00		0.80
	48	Arithmetic operation	0.64	1.00	4.88	***	0.52	0.69	3.78	***	0.57
	49	Copy of a numerical formula	0.58	0.91	4.85	***	0.37	0.61	2.98	**	1.07
	50	Editing of table	0.54	1.03	4.01	***	0.31	0.61	2.54	*	1.07
	51	Width change of row and colomn	0.37	1.19	2.38	*	0.31	0.67	2.31	*	0.26
	52	Keep the center	0.27	0.86	2.40	*	0.15	0.53	1.44		0.64
	53	Change of the number of numerical figures	0.64	1.00	4.88	***	0.35	0.68	2.56	*	1.36
	54	Drawing a ruled line	0.37	0.86	3.30	**	0.40	1.00	2.02	*	0.14
	55	Appointing print range	0.37	1.07	2.65	*	0.54	1.08	2.49	*	0.65
	56	Print preview	0.27	0.94	2.21	*	0.23	0.75	1.54		0.19
	57	Print	0.24	0.83	2.18	*	0.15	0.72	1.07		0.44
	58	Making of graph	0.14	1.10	0.94		0.46	0.69	3.33	***	1.38
	59	Editing of graph	0.24	1.11	1.63		0.42	0.74	2.85	**	0.77
	60	Function	0.61	1.29	3.60	***	0.42	0.63	3.35	***	0.70
		Mean	0.65	1.31	28.52	***	0.46	0.85	21.63	***	5.27 ***

*** p<.001, ** p<.01, * p<.05, + p<.1.

A t-test was performed of the pre- and post-presentation evaluation scores for each function for each of the three types of software for both ST and PI. The results are shown in Table 5. Of the 25 PowerPoint items, significant differences were confirmed for 21 items for ST and for all 24 items for PI. Of the 17 Word items, significant differences were confirmed for 9 items for ST and for 8 items for PI. Of the 18 Excel items, significant differences were confirmed for 12 items for ST and for 11 items for PI.

Table 6 shows the results of t-tests performed for each of the software types for average usage ability for all items. As Table 6 shows, significant difference verification found significance for increases for both ST and PI. This confirms that software usage ability increased for all three types of software. This shows that not only was there overall growth for ST and PI, but also that there was growth in software usage ability for each of the three types of software.

Table-6. Results of t-test for computer literacy of each software.

Software name	Storytelling (ST)				Product introduction (PI)			
	m	SD	t	p	m	SD	t	p
PowerPoint	1.13	1.54	28.17	***	1.00	1.18	21.55	***
Word	0.26	0.92	8.99	***	0.26	0.84	6.58	***
Excel	0.36	1.01	11.61	***	0.16	0.94	3.59	***
Mean	0.65	1.31	29.81	***	0.54	1.09	19.38	***

*** $p < .001$.

4.4. Comparison of Usage Abilities of Individual Software Functions

PowerPoint usage ability was lower than Word and Excel usage ability before the presentations. After the presentations, software usage ability for all three types of software was maximized, and there were no differences between each application.

Table 7 shows the results of variance analysis of the average usage ability for each of the three types of software for ST and PI. Software effects were significant ($F(5,114)=25.7$, $p<.001$). The results of multiple comparison are shown in Table 8. These results showed that there were no differences between ST and PI in terms of PowerPoint, Word, and Excel usage ability growth. PowerPoint usage ability grew significantly more than Word or Excel usage ability for both ST and PI, but there were no differences in the level of growth between Word and Excel.

Table-7. Results of analysis of variance for elongation of computer literacy of three kinds of softwares in ST and PI.

Source of variance	Sum of square	Degree freedom	Mean square	F-ratio	p
Condition	6.51	5	1.30	25.67	***
Error	5.78	114	0.05		
Total	12.29	119			

*** $p < .001$.

Table-8. Results of multiple comparison of the average usage ability for each of the three types of software for ST and PI.

Theme	ST			PI	
Software	Word	Excel	PowerPoint	Word	Excel
PowerPoint	>	>	=		
Word		=			=
Excel					=
PowerPoint				>	>
Word					=

>: $p < .05$,   =: n.s.

5. DISCUSSION

5.1. Comparison of Each Kinds of Required Time

As explained in Section 4.1, the average time taken outside of class to complete each work was, for the ST works, 18 hours for work one and 18 hours for work two, for a total of 36 hours. For the PI works, the average times were 14 hours for work one and 11 hours for work two, for a total of 25 hours. The ST and PI class times were 30 hours and 22.5 hours, respectively. In both cases the time spent outside of class was greater than the time spent in class, exceeding four unit times and two unit times of 60 hours and 45 hours. It would be fair to say that students spent sufficient time on activities and work outside of class. Students spent a great deal of time learning outside of class, and as the report indicates, enjoyed positive education benefits.

For ST, there were no significant differences in the times for each type of work within the three times and the total times for each project. For PI, however, there were significant differences in investigation times and the total times between projects. PI work one was a project introduction, so students investigated items related to the

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product they were going to introduce, and other products to compare it to. PI work two was a book introduction, so students investigated other books in order to introduce related books at the end of the work. Investigating related books was easy, so the investigation time spent on investigating comparison products is believed to have exceeded the time spent on investigating related books.

Analysis of significant differences between the three times and the total times for the ST and PI projects found a significant difference in slide creation time for the first work, with a longer time for the ST project. For the second work, as well, significant differences were found in the investigation times, slide presentation creation times, and total times, with longer times for the ST project. For both the first and second works, slide presentation creation times took longer for ST than PI. This is believed to be because in the framework of the PowerPoint file supplied for the PI works, the title could be used as-is, and it was very clear what content would go into which slide. This meant that there was little need for investigation and consideration, so only a small amount of time was required. The framework of the PowerPoint file supplied for the PI works served as reference in creating the slides, but there was a great deal of freedom regarding what content to enter into each slide, as well as a great deal of trial-and-error, so slide creation is believed to have been time-intensive.

The course in which the projects were carried out consists of interactive activities in which students learn from each other. This has potential for enabling students to see other peoples' works, and, using them as mirrors, learn from others and discover areas of their own works that required correction. Furthermore, students could see others' evaluations of their own works and learn how their works were evaluated. This created the potential for them to use these evaluations for reference, realizing problem areas and strong points in their own works, making it easier for them to make revisions. Students carried out ongoing activities, and this active learning cultivated their active thinking skills.

5.2. Regarding Increases in Strength-Related Awareness

As explained in Section 4.2, variance analysis and multiple comparison was performed of increases in average evaluation scores for each strength-related awareness item. These analyses found that for ST works one and two, overall, there was a greater degree of improvement of many awareness in work one, and a smaller degree of improvement in work two. This is believed to be because work one was the first work, so there was a large margin for growth, while work two was a continuation of work which students had become used to, and there was a smaller level of improvement awareness. The themes of works one and two were self-understanding and a children's story, respectively. The contents were completely different, and the awareness differences may have been due to less motivation to create the children's story.

Only for "(15) Presentation abilities" was the score higher for PI work one than PI work two. No other differences between scores were observed. We found that there were almost no differences in awareness between PI works one and two. This may have been because the themes of work one and work two were similar, consisting of a product introduction and a book introduction.

Comparison of ST and PI works one and two found that "(24) Satisfaction" growth for work one tended to be higher for ST. The increase in "(4) Broadening of computer usage methods and usage scenarios" for work two was higher for PI. For all other items there were no differences between ST and PI. The results showed that there were almost no differences in increases between ST and PI works one and two. From the standpoint of improving awareness, it appears that roughly equal results can be produced even if the themes differ.

5.3. Increases in usage Ability for Individual Software Functions

As Table 5 shows, the three software usage abilities for ST and PI were recognized as increasing significantly. This showed that not only was there an overall increase for ST and PI, but that usage ability for many items increased. This is believed to be because not only did students create slides in PowerPoint, but also created reports in Word, entered figures and text in evaluation sheets created from Excel files, and not only looked at figures, but also pasted them into reports and slides, so they improved usage abilities for many items, using many software functions.

Of the 25 PowerPoint items, significant differences were confirmed for 21 items for ST and for all 24 items for PI. There were many students who were surprised that they could record narration after turning their stories into slides. This is likely why "11. Recording narration" had the greatest increase. Items 15 to 25, which related to animation, also had greater increases in usage ability than other items. The instructions to include animations in all six slides appear to have been beneficial. With regard to PowerPoint, evaluation scores for ST item 8, "Slideshow implementation," were already roughly 2.9 before starting the works, so the lack of room for further increase following the creation of the presentation is believed to be the reason no significant difference was found.

Of the 17 Word items, significant differences were confirmed for 9 items for ST and for 8 items for PI. Word was used to create reports, which is why "26. Roles of Word windows," "27. Saving documents," and "28. Page layout" are believed to have risen. Students were required to insert tables into their reports, which is why "34. Drawing lines" and "35. Erasing lines" are believed to have risen. Students were also required to paste their Excel self-evaluation graphs and graphs of others' evaluations, PowerPoint slides, and Word text in their reports, which is why "37. Pasting images" and "41. Pasting text" are believed to have risen. The number of characters in the explanation narration had to be entered in the report, which is believed to be why a significant difference was found for "42. Determining the character count." There were significant difference tendency for two items: "27. Saving documents" and "39. Print preview." No significant differences were confirmed for 6 items for ST and for 7 items for PI. These were "30. Changing fonts," "31. Changing character styles," "36. Entering text," "38. Printing documents," and "40. Printing." For all of these, the initial level of awareness was already almost three, so there was little room for increase, and no significant differences were found.

Of the 18 Excel items, significant differences were confirmed for 12 items for ST and for 11 items for PI. Students had to perform arithmetic operations to determine their average self-evaluation scores and the average scores of others' evaluations of them, and to copy these into other cells. This is believed to be the reason for increases in "48. Arithmetic operations," "49. Copying formulas," and "60. Functions." Excel tables were created, resulting in increases in "45. Creating tables," "46. Saving tables," and "50. Editing tables," and when average evaluation scores were indicated in report tables, the number of decimal places had to be uniform, which is believed to be the reason for the increase for "53. Changing the number of decimal places." When creating tables, students were required to expand or contract column widths as necessary and center strings of numbers to increase visual appeal. These operations are believed to be what led to the increases for "51. Changing column and row widths and heights," "52. Centering" and "54. Drawing lines." Students used Excel in various situations, such as entering data into sheets, creating tables, and drawing graphs. This is believed to be what was responsible for the increase in "44. Roles of Excel windows." Before these projects there were few opportunities for printing from Excel, but during these projects students specified printing ranges and printed only necessary areas, which is believed to have produced the increases for "55. Setting print area" and "57. Printing." As the items whose scores increased show, when creating reports and evaluation sheets, instructing students to perform operations to create tables which would be easy to understand for anyone appears to have improved results. There was a trend of significant

differences for 3 items for ST. No significant differences were found for 3 ST items. No significant differences were found for 7 PI items. Awareness scores for "43. Starting Excel" and "58. Creating a graph" were already close to three before starting the projects, so the lack of room for increase is believed to be the reason no significant differences were observed.

Table 6 shows the results of t-tests performed for each of the three software types for average usage ability for all items for both ST and PI. There were significant increases in average usage ability for all three types of software for both ST and PI, and average ability levels after the projects were higher than before the projects. This is believed to be because the projects were designed to utilize the three types of software in various situations and activities.

5.4. Comparison of Usage Abilities of Individual Software

Students learn how to operate the three types of software during the first and second terms of their first year. They continue to use Word through their academic careers in situations such as the submitting of reports for various classes, so Word was the type of software for which students had the highest pre-project usage abilities. This was followed, in order, by Excel and PowerPoint. It is important that these applications be used in various activities, with students building up experience in using them to express themselves. It is hoped that the projects will enable students to use this software when they enter the working world. PowerPoint usage ability was lower than Word and Excel usage ability before the presentations. After the presentations, software usage ability for all three types of software was maximized, and there were no differences between each application. The projects appear to have enabled students to use the functions necessary for creating and giving presentations by having the students use PowerPoint to create slides about different themes.

This study showed that there were no differences between ST and PI in terms of PowerPoint, Word, and Excel usage ability growth. PowerPoint usage ability grew significantly more than Word or Excel usage ability for both ST and PI, but there were no differences in the level of growth between Word and Excel. This is because all of the classes consisted of using PowerPoint to create slides to introduce content.

Significant difference verification of ST and PI increases, performed using Table 6, found that ST increased by significantly more than PI did for PowerPoint, Excel, and overall. Based on Table 5, we determined that there were no differences in increases for individual ST and PI items between Word and Excel. Differences were found in 12 PowerPoint items, and of these, ST increases were greater than PI increases for 11. We believe that these results may be due to students being less motivated by the ST themes of self-understanding and creating a children's story than they were of the PI themes of creating product and book introductions.

6. CONCLUSIONS

We designed and carried out classes that employed active learning, in which students used PowerPoint to create storytelling works and product introduction slide presentations. For both projects, students decided what they wanted to introduce themselves, investigated related content, considered the introduction explanations they would provide, created slides, added animation, and recorded narration. Students viewed each other's slide presentations and learned from each other. They evaluated each other and provided comments regarding each other's works. They then revised their slide presentations, presented them to each other again, and evaluated each other again. This report has discussed the implementation of these classes, whose objectives were to increase self-understanding through the ST and to increase expressive abilities, planning abilities, and proposal abilities through

the PI by way of active evaluation activities and revision activities, through the process of mutual activity, coordinating with other students and completing works.

The findings in this study are summarized below:

1. In order to complete an ST work, the total amount of time taken to perform investigation aimed at creating explanations and slides, actually create slide presentations, and create reports was roughly 23 hours. For a PI work, this total time was 16 to 19 hours.

2. For both ST and PI, more time was spent working on the projects outside of class than in class, so it would be fair to conclude that there was sufficient activity and work performed outside of class.

3. For both the first and second works, slide presentation creation times took longer for ST than PI.

4. All 30 ability-related awareness for ST and PI works one and two appear to have improved, and there was little difference in the degrees to which awareness improved.

5. In class of creating two works, awareness in the second work rises if the heterogeneous degree of contents between two works is large.

6. Software usage potential increased significantly for all three types of software through the ST and PI projects.

7. PowerPoint usage ability was lower than Word and Excel usage ability before the presentations, but after the presentations there was no difference in usage ability between the three applications.

8. PowerPoint scores increased more than Word or Excel scores for both ST and PI. There was no difference in score increases between Word and Excel.

9. There was no difference in usage ability improvement for the three applications between ST and PI.

In the future, we would also like to analyze and report on blended classes which have already been carried out but not yet reported on. We would like to use clickers and analyze students' reactions to blended classes, and report on their effectiveness.

7. ACKNOWLEDGEMENTS

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