T. Hirashima et al. (Eds.) (2011). Proceedings of the 19th International Conference on Computers in Education. Chiang Mai, Thailand: Asia-Pacific Society for Computers in Education

Effects of Creating Digital Storytelling by Three Kinds of Themes

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Abstract: This paper is a report on the findings in making a storytelling with evaluation and modification activities conducted on a undergraduate level. The university's storytelling class enables students to both deepen the students' self-understanding and heighten their skills in using computers and problem solving. First students write a narration of a story relating to them and then convert the story to a slide presentation. After appreciating the story slide show together and evaluating them by peer, then the students modify them. The students in this study felt that these activities deepened their self-understanding, as shown by significantly high average rating scale values. The factor analysis was conducted on these values and found three factors: "skill in solving one's own problems cooperatively and creating," "skill in setting up problems and in expressing opinions," and "interest in computers and technical skills in using computers." The average rating values for the factors were raised significantly at the posteriori of creating the first work.

Keywords: storytelling, slide, evaluation activity, problem-solving skill, higher education, educational effects

Introduction

Many studies of new effective methods of teaching have been conducted [4]. It was found that classes can foster students' problem solving skills through a series of activities that repeat self-evaluation, peer evaluation, and correction of weaknesses in assignment to produce a product in a university class [5], [6], [9].

Creative activities producing products that inform and entertain people by describing real and imaginary events, using graphics, narration and music, are called storytelling [3]. In a digital storytelling, still pictures, such as photos, figures, and drawn pictures, are displayed sequentially with narration. Still pictures are easy to handle for the producers of such assignments, and students can reflect upon memories or what they learned through reviewing still pictures [2]. Digital stories can be easily reconstructed, and producers can distribute a story to many people via the Web [11]. It has been reported that the practical class improved the quality of their text narratives through the practice of digital storytelling, compared to the control class that did not practice it [1].

Students create things which others can use and evaluate each other. They correct the products based on others' evaluations. We let students learn how to create what others require. It is thought that students' skill to solve a problem can be fostered by such practice. The effect of storytelling depends to the purpose, the instructional design, etc. However, the changes and effects on students' perception related to skills are rarely measured quantitatively.

Creating storytelling was undertaken as a class in order to increase students' self-understanding and improve their computer skills. "self-understanding" means to understand and recognize oneself which character each student has and what he likes and

dislikes, and so on. Students create a slideshow in PowerPoint which tells a story about their life by looking back on it. In the creative process, we made students inform the meaning of correcting in making products and the method delivering to people what students consider by taking in the evaluation and correction process [7], [8]. Students were required to present report which was filled in content of product, self-evaluation, peer evaluation, and consideration about contents to report at the end of the classes. After checking the submitted report, the teacher pointed out unclear and incomplete elements. The students corrected their reports. It is reported that the attitude related to the skills acquired through these activities were improved [10]. In this paper, effects of creating digital story telling for three themes are explained by analyzing questionnaire for attitude related to abilities.

1. Instructional Design and Method

The interest course was an information science experiment, consisting of three hours/week as one of the compulsory subjects in the second term at A university. The "creating digital storytelling" unit consisted of 14 lessons and led by the author. Each class took 180 minutes, and the class proceeded according to the plan shown in Table 1. The class was conducted by a teacher and a teaching assistant (TA). After explaining the activities at the beginning of each class, they walked around the classroom and responded to questions as needed. There were 31 participants.

1.1 Purposes of Lesson

The purposes of this course are as follows: (1) to create a story on the assigned theme and thereby raise self-understanding and self-analysis, since they are important when searching for jobs; (2) to heighten students' skills in computer use, self-expression, and logic through creative activities; (3) to increase and develop problem solving skills through discovering the process of determining and creating something useful for people through the activities of evaluation and revision.

Since students tell their stories through a slide show in this class, it is important to create a scenario through which peers can understand their stories. In order to complement the narrative, they must consider how pictures and photos are composed and organized as expression unlike the sentence. They make their stories easy to understand in order to convey their actions and thoughts to peers by using a computer and manipulating the graphic and text media. The autobiographical nature of the storytelling assignment make the students think about themselves in the first story's draft. They are required to modify their works after the peer-review. Students are made understand that they should work while they think about a person in order to work for the person.

1.2 Lesson plans

Students are requested to make storytelling of the first work "self understanding," the second work "story for children", and the third work "future course" as a title in this class. The first, second and third works are made each in 5, 5, four weeks. The students draw six pieces of pictures in accord with the scene of the story and make them a slide of PowerPoint. The students are requested to include an animation to promote the understanding of the story. The narration is taped with a microphone so that the feeling of the contents of the story comes. A digital picture book is produced in this way.

The first work is to write a story related to autobiographical topics such as "my hobby," "my memories," and "dream in my childhood". The students were directed to include their

reflections upon these topics in order to express their thoughts to their peers and to further their own self-understanding.

The students are allowed to create the second work in order to understand that they worked for a person. As an example, the following examples are shown; "fantasyland, the adventure of dog, the story of the child of spider, the life of insect, the funny trip of the space, the underground world". The students were told so as to create the story which a child has interest in or which was useful for a child by this theme.

The third work was set to improve students' attitude to work. The students conduct self-examination enough and then are allowed to think about their future. As an example, the following examples are shown "a job that I like to get, workplace where I wanted to work, company which I wanted to take an entrance examination for, my dream, person that I wanted to be, work that allows me to take advantage of my hobby, my meaning to work, a company study, my job hunting, my qualification". The students were requested to think about a future course and to create the work with attitude to work by this theme.

In order to improve students' computer application-use skills, they are allowed to use Word, Excel, Power Point, and Paint software which was installed as one of Windows XP files. The students write a report using Word. A chart is made using Excel and is pasted on a report. A slide is created using PowerPoint. An illustration and a picture in according with a story are drawn to enhance the understanding of the story. It is loaded with an image scanner. The image is processed with paint. It is pasted on a slide.

Since the theme selection alone took one hour, the class session lasted for 90 minutes. An A4 30-page experiment description document was first distributed. The experiment's purpose, the contents, the plan, the slide creation method, and the experimental method, and related details were explained in the first session, based on the experiment document. Six pictures and the narrative stories could be entered using both sides of one sheet of A4 paper, as shown in Fig. 1. This is an example of the entered case. Students were assigned to write a story on the right-hand page, and to draw a related picture within the square frame on the left-hand page before the second session. Animation is made for deeper understanding for the story. Illustrations and characters which are made animation are drawn on the blank out of the frame.

The students were instructed to download the story slide of the "Diet Challenge Story" shown in Fig. 1 as an example for their assignment. They were required to create the story slides with the narration by the third session. At the beginning of the third session, the students were instructed on how to write reports, and were required to submit the file of the story slides at the end of the third session. The picture is drawn by color pencil on the paper sheet and is appreciated by image scanner. Then it is modified using Paint software. The narration was recorded using a microphone. Students performed self-assessments after the first draft's completion at the end of the third lesson, after modification in the fourth session, and after the final evaluation in the fifth session.

A peer evaluation sheet and all works of students were printed and distributed in the fourth session. The slide shows of all members in the class were projected on the screen in succession. Students were directed to appreciate the story slide show at the same time and then evaluate them for one minute. Each show was immediately followed. After evaluating all the stories, the evaluations were input into an assessment spreadsheet of Excel, and the files were submitted using Web. The teacher gathered and summarized the evaluations in files of all students, then enabled each student to download the peer evaluations from an e-learning portal that allowed each student to download the peer evaluations. The teacher pointed out the point that should be revised in the printed work and distributed it to a student. The students were then required to modify their digital stories by referring to the peer evaluations and the advice of the teacher in the fourth session.

The modified story slides were appreciate again the story slide show in the same manner as the fourth session, and then evaluated once again in the fifth session. The second peer evaluation was input into an assessment spreadsheet, and the file was submitted. This was processed in the same manner as for the fourth session. Students pasted the second peer assessment for themselves on an assessment spreadsheet. By comparing the first evaluation with the second one, students could learn and interpret the appropriateness of the corrected elements.

Table 1: Lesson plans.

Time	Work	Lesson content
1	First work	Explanation of theme, priori consciousness survey related to skills, information retrieval, story creation
2		Story submission, slide creation based on the first story
3		Slide creation, recording of narration, self-evaluation, writing the first of the first report
4		Appreciating slide show of the first story, peer evaluation, modification of story and slides, writing the second of the first report
5		Appreciating slide show of the story, peer evaluation, writing the third of the first report, posteriori consciousness survey related to skills
6	Second work	Story submission, information retrieval, slide creation based on the second story
7		Slide creation based on the second story, making animation
8		Slide creation, recording of narration, self-evaluation, writing the first of the second report
9		Appreciating slide show of the second story, peer evaluation, modification of story and slides, writing the second of the second report
10		Appreciating slide show of the story, peer evaluation, writing the third of the second report, posteriori consciousness survey related to skills
11	Third work	Story submission, information retrieval, slide creation based on the third story
12		Slide creation based on the third story, making animation, recording of narration
13		Appreciating slide show of the third story, peer evaluation, writing the first of the third report
14		Writing the second of the third report, posteriori consciousness survey related to skills

1.3 Contents of report

The student reports of about 15 pages were written in three steps using Word, and were submitted on the days prior to the 4th, 5th and 6th sessions. The elements corrected were noted by the teacher and the report was returned during class hours. Contents of the report consist of the following 11 items: (1) definition of storytelling and digital picture books, (2) contents of the story slide show, (3) structure of the product, (4) self-evaluation of story and its slide show, (5) peer assessment from reading the story slide show, (6) the elements of the story and the slide show modified based on peer assessment feedback, (7) the correction elements modified based on teacher feedback, (8) evaluation of the peer's product, (9) changes of the contents from re-evaluation of the corrected product, (10) change of attitude of their skills improved by the course, and (11) discussion of the items (2)–(10).

1.4 Function of e-learning

The students obtained the template of the report and assessment spreadsheet file from the e-learning portal. The teacher created the worksheet required for the evaluation activities of the lesson as an Excel assessment spreadsheet. The contents of the assessment consist of three self-assessments, two peer-evaluations, and pre- and post-evaluation of the student's attitude of his/her own skill. The file was submitted through the e-learning portal. Students can use the following functions.

(1) Browsing: The example of story slide, how to draw illustration, how to create story slides, set-up procedure of animation.

(2) Download of files: The paper sheet in which a story and a picture are entered (Word file), template of the report (Word file), template of the assessment spreadsheet (Excel file), results of peer assessment, experiment description document (PDF file).

(3) Upload of files: Report (Word file), assessment spreadsheet (Excel file), story slide (PowerPoint file).

(4) Bulletin board.

(5) E-mail

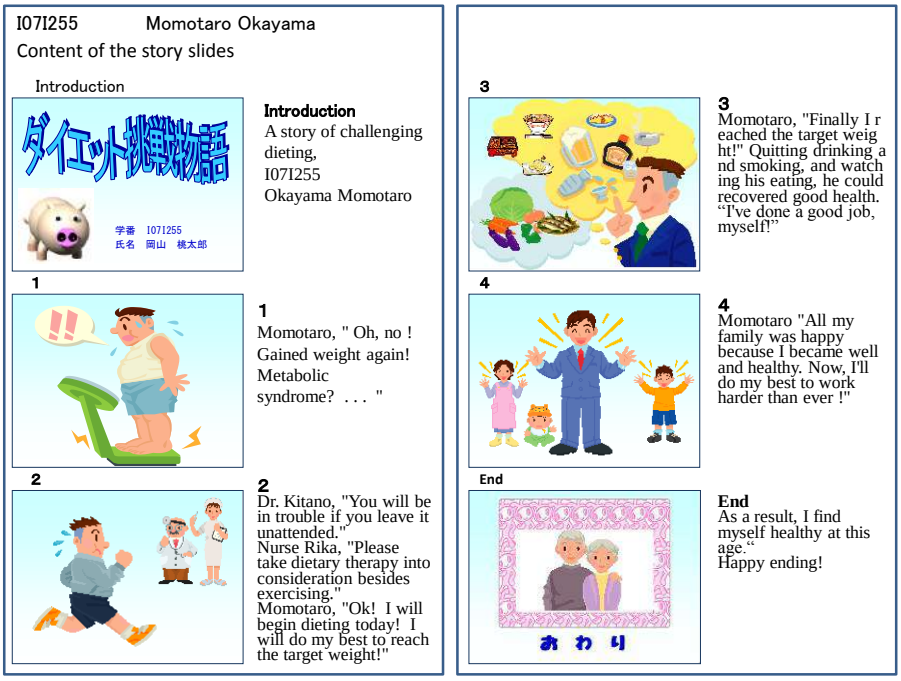

Figure 1 Sheet example in which a story and a picture are entered (entered case)

2. Analysis Result and Discussion

The students' attitude related to their skill was analyzed in order to find difference of the learning effects gained by creating the three kinds of storytelling works described in the previous chapter. The factor analysis was conducted and related factors are extracted.

The significant difference will be judged at the 5% significance level.

2.1 Change in Degree of Self-understanding

By asking "What is the degree of self-understanding?" and "What is the degree of comprehension of working?" at the post and the end of having created the first, second and third works, we made students report the degree of their understanding. "comprehension of working" means to understand for what a job is haven, which occupation is wanted to become, what is meaning to work, and so on. There are five scores in the semantic differential: 1. no, 2. somewhat no, 3. no opinion, 4. somewhat yes, 5. yes. There were 31 respondents for each of the three sessions.

Table 2 shows the results of analysis of variance regarding these degrees. Where, m and SD mean the average and standard deviation respectively. There were significant differences among the three average rating values of self-understanding and understanding of working. Then multiple comparisons were conducted among them. This showed that they could learn more about themselves by creating the first stories. Self-understanding and understanding of working improved because they created the third works through considering their dreams and careers which they wanted in the future.

The discussion section of the reports contained comments supporting this result: "I was able to understand myself by creating a story, drawing the pictures and making the slides," " It was useful for understanding what I should do from now on," and "By seeing the slide shows of friends and realizing the differences from myself, I came to understand myself better." This showed that the course objective of raising self-understanding had been achieved.

Table 2 Change of the degree of self-understanding

Items	Post		First		Second		Third		Square sum		Mean square		F value	p	Multiple Comparisons					
	m	SD	m	SD	m	SD	m	SD	Condition	Error	Condition	Error			Post: 1st	Post: 2nd	Post: 3rd	1st: 2nd	2nd: 3rd	1st: 3rd
Self-understanding	2.7	0.6	3.4	0.6	3.2	0.6	3.8	0.6	19.9	47.9	6.6	0.40	16.6	***	*	*	*		*	*
Comprehension of workin	2.7	0.6	3.4	0.6	3.3	0.6	3.9	0.6	22.7	47.9	7.6	0.40	19.0	***	*	*	*		*	*

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

2.2 Change in Student's Attitude of Their Skills

Regarding the students' attitude of their skills, as shown in Table 3, rating values were entered on an assessment sheet, and submitted at the first session (priori), the 5th, the 10th, and 14th session. Students rated their skills and attitude on a nine-point scale: 1. Not at all; 3. slightly yes; 5. somewhat yes; 7. considerably yes; 9. extremely yes. The number of respondents to questionnaires at four times is 31 persons. Averages and standard deviations of priori and posteriori are shown in Table 3. The posteriori after having created the first, second and third works are called the first posteriori, the second posteriori and the third posteriori in the following respectively.

The analysis of variance was conducted among the average rating values for attitude of skills in priori and three posteriori as a whole of the 30 items. As the result, significant difference was recognized ($F(3,116)=35.3$, $p<.001$). Then multiple comparisons are conducted by LSD method. The result showed that significant difference between priori and three posteriori was recognized as shown in Table 3 ($MSe=.71$, $p<.05$). This showed that all the students' attitude of their skills improved. It was found that their self-confidence regarding their computer and problem-solving skills improved in this study. The significant difference tendency was recognized between the first and the second posteriori. The significant difference between the first and the third posteriori and between the second and the third were not recognized. Changing a theme of the storytelling brings an effect until twice. However, it seems to be difficult to raise attitude of the student even if the student makes the third work successively.

The analysis of variance for each item was conducted among the average rating values for attitude of skills in priori and three posteriori. Significant difference was recognized about all items as the result as shown in the column of F and p of Table 3. Then multiple comparisons are conducted by LSD method. The result showed that significant differences between priori and three posteriori were recognized about all of 30 items.

In addition, the items where significant difference was admitted between the first and the second posteriori were (6) skill in mapping out a plan and (25) sense of accomplishment. The student acts according to a series of flows to create the story, draw the illustration, make a slide, record the narration, and write a report as shown in Table 1. It is supposed that the skill (6) was obtained by activities of creating the storytelling. Because the students finished one work, it is supposed that they might taste a feeling of accomplishment corresponding to (25). The items where a tendency of significant difference was admitted between first and the second posteriori were (15) skill in giving a presentation and (24) sense of fulfillment.
The item where significant difference was admitted between the second and the third posteriori was zero. The item where a tendency of significant difference was admitted was (12) skill in expressing self-opinions in sentences. The rating values of item (12) for priori and three posteriori were 3.6, 5.4, 5.6, and 6.2 respectively. The rating values rise gradually as times of writing the reports increase. It shows that experience is important for attaining this skill. The no attitude rising significantly between the second and the third posteriori means that most of the attitude does not change between the second and the third posteriori. The reasons are thought as follows: It have been difficult to make a story of the third theme because many students did not yet decide "a future course" in early December of the third grader; The preparations time have been short because the teacher communicated the third

theme just before one week; The period is short for one week. The result in analysis of variance in Table 3 showed that (1) interest in computers, (2) understanding of computers, (3) technical skills with computers, and (4) methods of computer use improved. These results demonstrated that the course's objective "to improve skills in using personal computers," was achieved.

The students' report indicated they gained the attitude of skills through the course as follows: The number of students who said, "I could master or use narration, PowerPoint, a computer, Word, Paint, animations, an image scanner, and Excel," were 29, 26, 17, 8, 8, 6, 6, and 2 respectively. The number of descriptions totaled 102, and the average per person was 3.3. All the students have described how well they can use any of the computer skills. This showed that another course objective, "improving computers application skills," was achieved.

Through creating slide of storytelling, the students acquired "skill in expressing self-opinions in sentences" by writing stories and reports, as well as "skill in expressing through non-verbal media" by drawing the pictures of their stories. Thus, it seems that the purpose of raising the students' attitude of all their skills related to problem solving was also achieved, since all their post-attitude rating values regarding skills improved significantly, as shown in Table 3.

Factor analysis was conducted by using the rating values for 30 items of the questionnaire in priori and three posteriori. The principal factor analysis was used for the extraction of factors. Three factors were extracted based on having an eigenvalue of more than one. The contribution ratio by the three factors was 69.7% in total. Factor 1 consists of (23), (21), (22), (28), (29), (17), (24), (13), (8), (19), (18), (20), (27), (9), (26), (10), (25), (6), and (7). Factor 2 consists of (12), (14), (15), (5), and (16). Factor 3 consists of (4), (3), (2), (1), and (30). By items consisting of each factor, factor 1, 2 and 3 were interpreted respectively as follows: "skill in solving one's own problems cooperatively and creating," "skill in setting up and expressing an issue (problem)" and "interest and skills in computer use." Results of t-test using average rating values belonging to each factor show that factors 1 and 3 rose significantly from the priori to the second posteriori. Factor 2 rose significantly from the priori to the first posteriori.

Table 3 Result in analysis of variance for the rating values regarding skills.

Evaluation items	Priori		First		Second		Third		SS		MS		F	p	Multiple comparisons					
	m	SD	m	SD	m	SD	m	SD	Cond.	Error	Cond.	Error			Priori -1st	Priori -2nd	Priori -3rd	1st- 2nd	1st- 3rd	2nd- 3rd
(1) Interest in computers	4.5	1.8	6.1	1.5	6.5	1.3	6.4	1.1	80.9	265.1	27.0	2.2	12.2	***	*	*	*			
(2) understanding of computers	3.6	1.2	5.7	1.1	6.0	1.2	6.4	1.4	148.6	188.9	49.5	1.6	31.5	***	*	*	*		*	
(3) technical skills with computers	4.0	1.3	5.6	1.1	6.0	1.1	6.1	1.1	85.9	170.1	28.6	1.4	20.2	***	*	*	*			
(4) methods of computer use	4.6	1.0	5.7	0.7	5.8	0.9	6.1	1.1	38.6	105.6	12.9	0.9	14.6	***	*	*	*			
(5) skill in clarifying problems	4.3	1.1	5.8	1.0	6.1	0.9	6.6	1.4	91.0	159.2	30.3	1.3	22.9	***	*	*	*		*	
(6) skill in mapping out a plan	4.4	1.3	5.4	1.1	6.1	1.0	5.9	1.1	54.3	163.9	18.1	1.4	13.3	***	*	*	*	*	+	
(7) deepening of understanding knowledge	3.9	1.4	5.5	1.0	5.7	1.1	5.9	1.3	82.3	183.9	27.4	1.5	17.9	***	*	*	*			
(8) skill in studying independently	4.5	1.3	6.0	1.2	6.2	1.2	6.3	1.2	63.1	181.0	21.0	1.5	13.9	***	*	*	*			
(9) skill in collecting information	4.8	1.1	5.8	1.1	6.1	1.0	5.9	1.5	31.3	171.5	10.4	1.4	7.3	***	*	*	*			
(10) skill in sorting information and necessary data	3.8	1.2	5.8	1.3	6.0	1.3	5.7	1.1	93.6	187.0	31.2	1.6	20.0	***	*	*	*			
(11) skill in analyzing information	4.0	1.2	5.3	1.1	5.7	1.1	5.7	1.5	61.5	189.2	20.5	1.6	13.0	***	*	*	*			
(12) skill in expressing self-opinions in sentences	3.6	1.2	5.4	1.1	5.6	1.1	6.2	1.0	115.3	156.0	38.4	1.3	29.6	***	*	*	*		*	+
(13) skill in expressing through non-verbal media	3.9	1.4	5.6	1.3	5.8	1.3	5.9	1.3	85.1	225.5	28.4	1.9	15.1	***	*	*	*			
(14) skill in creating simple explanations	3.4	1.1	5.1	1.1	5.3	1.1	5.8	1.4	101.9	168.2	34.0	1.4	24.2	***	*	*	*		*	
(15) skill in giving a presentation	3.6	1.4	5.2	0.9	5.8	1.1	6.0	0.9	105.5	151.7	35.2	1.3	27.8	***	*	*	*	+	*	
(16) skill in understanding others' explanations	4.2	1.3	5.4	1.1	5.8	1.2	5.8	1.0	52.4	166.1	17.5	1.4	12.6	***	*	*	*			
(17) skill in communicating with others	4.4	1.2	5.4	1.2	5.8	1.3	5.8	1.3	39.6	201.1	13.2	1.7	7.9	***	*	*	*			
(18) skill in accurately judging self-evaluations	4.4	1.3	5.8	1.2	6.2	1.0	6.3	1.0	66.7	159.7	22.2	1.3	16.7	***	*	*	*		+	
(19) skill in accurately judging others' opinions	4.4	1.4	5.5	1.1	5.9	1.0	6.0	1.0	49.9	155.7	16.6	1.3	12.8	***	*	*	*		+	
(20) skill in improving and correcting	4.4	1.4	5.8	1.2	5.9	1.3	5.8	1.2	46.4	201.2	15.5	1.7	9.2	***	*	*	*			
(21) skill in performing detailed investigations	4.0	1.5	5.5	1.3	5.9	1.2	5.8	1.0	76.5	196.2	25.5	1.6	15.6	***	*	*	*			
(22) skill in completing research	4.2	1.4	5.7	1.3	5.9	1.3	5.9	1.2	64.7	205.8	21.6	1.7	12.6	***	*	*	*			
(23) skill in cooperating with each other	4.0	1.5	5.4	1.4	5.8	1.5	5.8	1.2	67.0	244.4	22.3	2.0	11.0	***	*	*	*			
(24) sense of fulfillment	4.1	1.2	6.1	1.4	6.8	1.4	6.4	1.4	128.8	221.8	42.9	1.8	23.2	***	*	*	*	+		
(25) sense of accomplishment	4.1	1.3	5.9	1.3	6.8	1.1	6.3	1.4	129.6	200.5	43.2	1.7	25.8	***	*	*	*	*		
(26) skill in solving one's own problems	4.1	1.4	5.8	1.2	6.1	1.1	5.8	1.2	76.9	183.4	25.6	1.5	16.8	***	*	*	*			
(27) skill in organizing information	4.1	1.3	5.7	1.3	6.3	1.3	6.2	1.1	90.2	198.0	30.1	1.6	18.2	***	*	*	*			
(28) skill in thinking independently	4.1	1.3	5.5	1.5	6.0	1.3	6.2	1.4	86.2	238.0	28.7	2.0	14.5	***	*	*	*			
(29) skill in creating something	4.1	1.4	5.5	1.1	5.9	1.0	5.8	1.2	66.9	175.7	22.3	1.5	15.2	***	*	*	*			
(30) interest in artificial intelligence	4.7	1.9	6.3	1.5	6.8	1.5	6.6	1.6	85.4	327.9	28.5	2.7	10.4	***	*	*	*			
Average	4.1	0.9	5.6	0.8	6.0	0.8	6.0	0.7	75.2	85.2	25.1	0.7	35.3	***	*	*	*	+		

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

3. Conclusion

The storytelling using the slide was made about three themes, was evaluated by peer and was corrected in this practice. The following results were found in the practice:

(1) The students' self-understanding was deepened significantly at the first posteriori, did not rise at the second posteriori, and rose at the third posteriori. This suggests development of self-understanding depends on theme content.
(2) The skills in using computers were heightened using software as Word, PowerPoint, Excel, and so on.
(3) The attitudes related to skills rose significantly by the first posteriori, tended to rise from the first posteriori by the second posteriori, and did not rise at the third posteriori. This suggests development of attitude depends on repetition of practice.
(4) Factor 1 "skill in solving one's own problems cooperatively and creating" and Factor 3 "interest and skills in computer use" rose significantly by the second posteriori. Meanwhile, factor 2 "skill in setting up and expressing an issue" rose significantly by the first posteriori and tended to rise until the third posteriori.

Further it is planned that the author classifies students and wants to examine the difference of the effect by students' characteristic.

Acknowledgements

The author appreciates the support of the Grant-in-Aid for Scientific Research, foundation study (C22500949) provided by the Ministry of Education, Culture, Sports, Science and Technology, Japan for this research.

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