Active Learning in Maritime Education

Yoshiaki Kunieda[1], Koji Murai[2]

(1. Tokyo University of Marine Science and Technology, Japan;

2. Kobe University, Japan)

Abstract: In recent years, active learning has been highlighted as a more effective educational technique. Maritime education has generally consisted of a lecture in the classroom and onboard training. We have introduced active learning into the classroom lecture process. And we investigated the effect of this active learning-type lesson. In this paper, an exercise involving pair and group discussions was conducted, student assessment of which showed that around 60 percent of students found the lesson to be "very good" or "good". Furthermore, after giving a presentation following the group discussion, about 72 percent of students felt that the lesson was "very good" or "good". Thus, there was a generally positive assessment of both the first and second active learning-type lessons. Then, to investigate this good assessment result, comments collected from the students were analyzed using the Grounded Theory Approach (GTA).The result of GTA, the following text hypothesis was taken as an example. "There were effects, such as the creation of an idea, from the free-flowing exchange of opinions in groups of a small number of people, and it was a pleasant and intelligible lesson".

Key words: active learning, communication, group discussion, presentation

1. Introduction

In recent years, education research has highlighted active learning as an important element for the "conversion to study from education"; in other words, active learning is a more effective educational technique (Matsushita et al., 2015). Maritime education generally consists of lectures in a classroom and onboard training, which could be said to be the active learning itself. It is thought that onboard training can just be said to be the active learning. On the other hand, the lesson in a classroom is indispensable to acquisition of knowledge and technology. And we think that still more effective education is realizable by taking the element of active learning into the lesson in a classroom. Introducing active learning into the classroom lesson could further stimulate learning and understanding. After the lesson, students were asked to give their opinion using an assessment instrument. It was found that on an overall active learning was successful for several reasons.

2. Active Learning

In 2012, the Central Council for Education in Japan defined active learning as "A general term for teaching and learning methods that involve the participation of the student in active study unlike one-way lectures from a teacher. When a student learns actively, he/she is engaged cognitively, ethically, and socially with the learning,

Yoshiaki Kunieda, Professor, Master Mariner, Tokyo University of Marine Science and Technology; research areas/interests: maritime education and training (MET). E-mail: ykunie0@kaiyodai.ac.jp.

culture, knowledge, and experience. Discovery methods, problem-solving, experiential studies, and investigative study are included. Debates and group work are examples of classroom methods for effective active learning". Professor Mizogami of the Kyoto University Center for the Promotion of Excellence in Higher Education defined the benefits of active learning as "Active learning overcomes passive one-sided knowledge transfer-type lessons. Active learning requires students to participate in 'writing,' 'talking,' and 'presenting,' thereby ensuring that cognitive processes are engaged" (Mizogami, 2014). Active learning is not a specific study method, but a teaching and learning process in which the student is required to actively perform with a purpose.

3. Implementation of an Active Learning-Type Lesson

An active learning-type lesson was conducted with 66 students from the Tokyo University of Marine Science and Technology, Faculty of Marine Technology, Undergraduate Maritime Systems Engineering course in 2015.

3. 1 First Lesson

The composition of the first lesson was as follows.

(1) Setup and explanation of the target (10 minutes),

(2) Exercise in ship operations (50 minutes),

(3) Explanation of the content of the exercise (10 minutes),

(4) Debriefing (a questionnaire was included) (15 minutes).

The "acquisition of seamanship" was set as the lesson target. Definitions of seamanship by Captain Chiba, Professor Sugizaki, and the National Institute for Sea Training (2011) were first introduced. In each case, seamanship included not only knowledge and skills but also actions, various functions, and capabilities. When conducting the exercise, the following three-point explanation was given.

(1) Students set up and recorded their own target. The target of the lesson was not restricted, so students could describe the target freely, making the setting up easy.

(2) There was a pair discussion in which the students' own ideas were conveyed and taught.

(3) In the time given, students conveyed and taught their ideas to other teams.

The exercise consisted of the following three questions:

(1) Enumerate the uses of Buys-Ballot's law.

(2) Indicate the risks of being in the fore-station when a vessel enters and leaves port.

(3) Indicate the cause of a marine accident, related matters, and countermeasures.

In the explanation time, students gave a presentation on their own ideas. Students were asked to consider the possibility of performing exercises and were encouraged to think deeply about the issues from broad and various angles. The target of the lesson was shown again as a "debriefing", which allowed the students to reflect on whether the target of the lesson had been achieved.

3.2 Second Lesson

The composition of the second lesson was as follows. The exercise content was more limited than in the first lesson, but the presentation time was greater. By having to decide on the presentation content themselves, students were positively encouraged to participate.

(1) Setup and explanation of the target (10 minutes),

(2) Exercise (20 minutes),

(3) Presentation (40 minutes),

(4) Debriefing (a questionnaire was included) (15 minutes).

The target, as with the first lesson, was the "acquisition of seamanship". However, the focus was on concretely considering seamanship. The students' personal considerations as to what they felt seamanship was allowed them to be inventive and creative. The exercise required students to imagine they were crewing a new ship. The exercise was performed using the following method.

(1) Groups of 4 to 6 people were formed.

(2) A leader was chosen.

(3) Each of the three proposals was considered.

(4) Each member gave a presentation for the proposal they preferred, including its main features and advantages. The other members of the group neither evaluated nor criticized the presentation.

(5) The groups decided on the proposal they all preferred under the encouragement of the leader. A new group proposal was developed from the ideas of the other proposals, and further additions and improvements were made. Finally, a group proposal was developed.

(6) The student group then developed figures and drawings to easily explain "the group proposal".

(7) A final group presentation in which all members were involved was developed and given to the class.

Proposals for the new ship had to be creative and consider possible new concepts, such as its form, propulsion, and operations. Even if the type of ship considered was not possible at the present time, such innovative proposals were encouraged as such a ship may be possible in 10 or 50 years.

Thirteen groups gave 3-minute presentations about their new ship, and then in the "debriefing," students considered the lesson target and completed the questionnaire.

4. Results

4. 1 Assessment of the Lesson by Students

4.1.1 The First Lesson

Students' assessment of the first active learning lesson is shown in Figure 1. Fifty-nine percent thought the lesson was "very good" or "good". The comments from the students who assessed the lesson as "very good" were as follows.
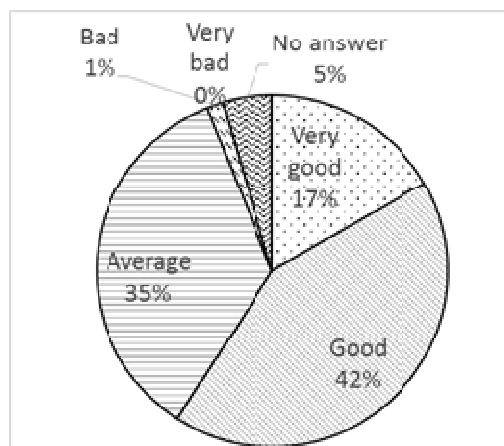

Figure 1   Results of Student Assessment of the First Lesson

- It was very intelligible.
- The thinking required in the lesson was very pleasant.
- It was good to consider an actual marine accident case.
- While consulting during the exercise, our knowledge of onboard training was useful.
- By performing the exercise, there was an active exchange of opinions.
- The more I thought, the more ideas I had.
- I had noticed that there was a limit to my own ideas, so by working in pairs, I could understand what I did not fully know.
- I was happy to have such lessons many times. I thought that there should be more opportunity for discussion.
- I thought that it was a very good lesson as exchanging opinions with another person can deepen the understanding of the subject under discussion and share each other's ideas.
- It was a very significant lesson.

On the other hand, the comment given by the student who assessed the lesson as "bad" did not include a clear statement. When the students were asked a question about what they had "noticed" during the lesson, the following replies were given.

- I noticed that there was no knowledge about the ship.
- I thought that I would always consider various things.
- I noticed a viewpoint I did not have.
- Various ideas occurred by considering one viewpoint deeply.
- By thinking as a pair, I noticed the development of an interesting idea that I had not had myself.
- When speaking out, the argument swelled.
- I noticed the importance and pleasure of discussion.
- The target was checked.

From these comments, it can be seen that in an active learning-type lesson, the content was especially noticed.
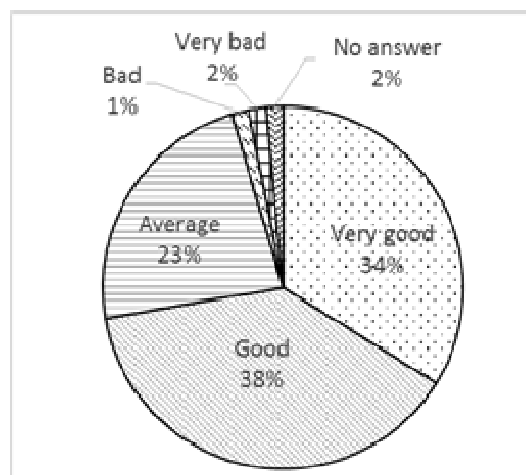

Figure 2   Results of Student Assessment of the Second Lesson

4.1.2 The Second Lesson

The main feature of the second active learning-type lesson was having the opportunity to prepare a presentation for all students. Students' assessment of the second active learning lesson is shown in Figure 2. Seventy-two percent of students rated the lesson as "very good" or "good", with one person assessing the lesson as "very bad".
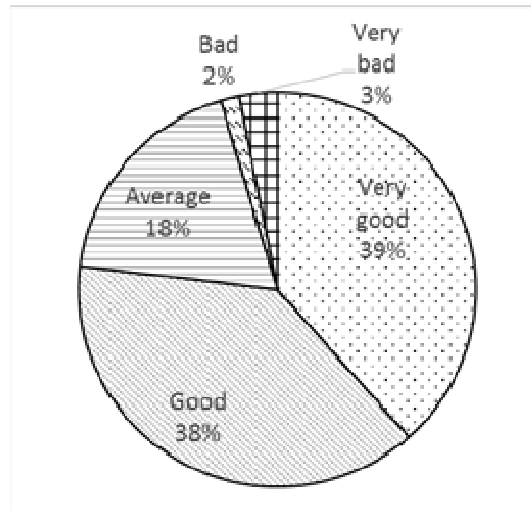

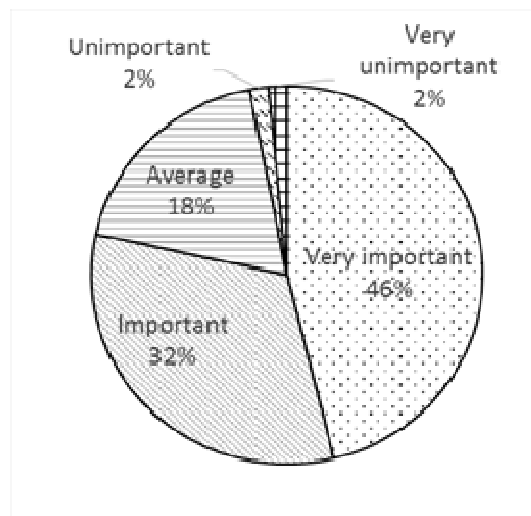**Figure 3   Assessment for Discussion on a New Ship**

Figure 4   Assessment of Creative Thinking

This active learning-type lesson created some tension as all members were required to be part of the presentation. Following are the comments of the students who participated in the lesson. In the exercise in the second lesson, a "creative way of thinking" was set as the concrete target for seamanship. Therefore, in the questionnaire, a question was asked about "whether it was pleasant to consider a new ship". The results are shown in Figure 3. Seventy-seven percent felt that it was "very good" or "good".

For the question focused on the concrete target, "what is your opinion about creative thinking", 78% felt it was "very important" or "important", as shown in Figure 4. This was similar to the assessment of the exercise

subject shown in Figure 3.

4.2 Qualitative Data Analysis of the Comments on the Lesson

There was a generally positive assessment of both the first and second active learning-type lessons. To investigate this good assessment result, comments collected from the students were analyzed using the Grounded Theory Approach (GTA).

4.2.1 The First Lesson

After understanding the content of the comment, each comment was classified in a process called "sectionalization". Next, the characteristics and dimensions of the data were shown and further processing called coding was conducted to identify a label name that expressed the general focus. For the comments on the first lesson, an example of the coding is shown in Table 1.

Table 1   Example of the Coding for the First Lesson (1)

No.	Data	Property	Dimension	Label name
1	·I also discovered what I did not know as the exercise was done in a pair. ·As it was an exercise in a pair, it was very good for the development of various ideas.	·Exercise in a pair ·Idea creation	·Working in a pair has a good result. · Since many ideas were created, it was good.	(1) In the pair, new knowledge was absorbed. (2) In the pair, many ideas were created and it was a good result.
2	· It was good to consider an actual collision accident.	· A actual case is considered.	·The actual case was good. ·It was good to consider.	(3) The good effect of considering the actual case.
3	·It turned out that it leads to a serious accident from a few small causes.	·The cause of the actual case	· Understanding the relationship between an accident and a cause	(4) An understanding of the relationship between the accident in an actual case and a cause
4	·The more I thought, the more the ideas were created.	·Idea creation	·Many ideas are created.	(5) Creating ideas in the lesson to consider.
5	· Since our brains were being used, it led to an improvement in my imagination, so it was good.	·The lesson to consider	·Using brains in many cases. ·It lead to an improvement in imagination.	(6) Using brains and improvement in imagination.
6	·When arguing with people, new ideas were created that I had not thought of before.	· Arguments lead to the creation of ideas. ·New ideas and various ideas	·The effect of creating ideas through argument	(7) Creating ideas through argument
7	·A new idea could be discovered by talking , and it was interesting.	·Communication	· Pleasure of discovery by communication	(8) The effect of discovery by communication.
8	·The lesson involved exchanging opinions, so we could share ideas and gain a greater understanding of the exercises; it was a very good lesson.	·Exchange of opinions · An idea shared by the exchange of opinions.	·A good lesson because of the exchange of opinions · The effect of deepening understanding by sharing ideas	(9) Sharing of ideas through exchanging opinions. (12) Advancement of understanding by sharing ideas. (15) A good lesson because of the exchange of opinions.
9	· The exercise implementation strengthened the importance of maritime jobs.	·Thinking about maritime jobs	·Strengthening the idea of the maritime job	(10) Strengthening maritime job importance
10	·I thought that I would learn about Seamanship.	·Appetite to study	· The appetite to study improves.	(11) Improvement in appetite to study Seamanship
11	·The lesson in which "thinking" was involved was very pleasant."	·A pleasant lesson	·The thinking in the lesson was very pleasant.	(13) It was a pleasant lesson because of the need to think.
12	· It was a very intelligible lesson.	·Assessment of the lesson by students	·An intelligible lesson	(14) Assessment good since it was an intelligible lesson.

For example, data No.1 in Table 1 is "I also discovered what I did not know, as the exercise was done in a pair". From this data, the property assigned relates the "exercise was done in a pair" with "working in a pair has a good result" as the dimension. A property expresses the characteristic of the data in question, which was that the exercise was carried out by two people as part of an active learning-type lesson. The dimension is converted into words that indicate the grade and a degree of the assessment, so the label name is "In the pair, new knowledge was absorbed". From the main comments from the first lesson, 15 labels were extracted. Then, the comments that were similar or common in the coded data were summarized in the category. The 15 label items shown in Table 1 were summarized into 8 categories. The relationship of each category is shown in Figure 5. First, the categories were extracted by sorting the 15 labels into 8 categories. For example, the label names "(1) in the pair, new knowledge was absorbed" and "(2) in the pair, many ideas were created and it was a good result" were summarized into category "(A) the effect of working in pairs". A category consists of three elements: "the contents or the feature", which illuminate the situation in the lesson, "effect of the lesson", which expresses an act and an action, and an "assessment of the lesson", which indicates a result or a conclusion.
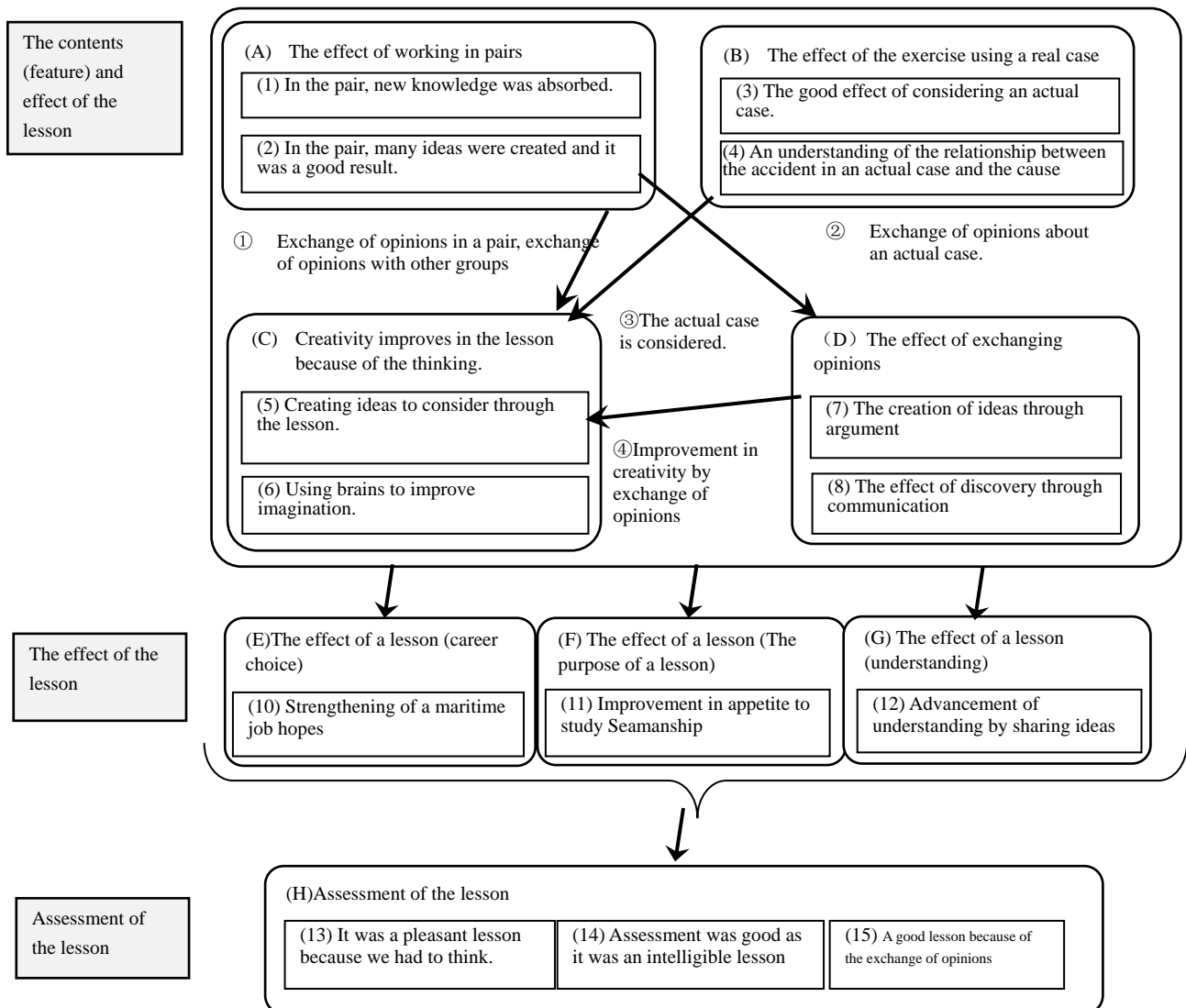

Figure 5   Categorization Using GTA (1)

Since the contents (features) and the effect of a lesson were inseparable, as shown on the right-hand side of the Figure 5, they were combined in "the contents (feature) of the lesson and the effect". It was divided into groups for the "contents (feature) and the effect of the lesson" and "the effect of a lesson", which summarized the effect of the whole lesson and the group "assessment of the lesson". As shown in the figure, in the group "the contents (feature) and the effect of a lesson" there is a mutual relationship between the contents. The group "the effect of a lesson", however, does not refer to specific contents but rather to the effect of the whole lesson. For example, it was expressed that the whole lesson had strengthened an interest in maritime jobs and an appetite to study seamanship. The students' comments were focused on the lesson contents, the lesson effect, and the assessment of the lesson. The effect category illuminated the characteristic contents of a lesson. The student assessment showed that they felt that the general effect of the lesson was good. The following text hypothesis was taken as an example. "There were effects, such as the creation of an idea, from the free-flowing exchange of opinions in groups of a small number of people, and it was a pleasant and intelligible lesson."

4.2.2 The Second Lesson

Concerning the 2nd lesson as well as the 1st lesson, the qualitative analysis of a student's comment was conducted by GTA. It carried out the coding as shown in Table 2, and the label name of 12 was acquired. As a result of hearing the others' presentation, there were many comments over thinking of the others, an idea, and creativity. Since thinking of the others and an idea were heard by having prepared presentation time, we think that there were many such comments. There were also comments of the good evaluation to the presentation itself. And, there were comments with a good effect by carrying out the exchange of opinion in a group.

The category classification of the label name of 12 obtained by coding is carried out, and categorization using GTA is shown in Figure 6. Student's comments have many contents that are about an assignment implementation. On the other hand, there are "effect of group study", "effect of a presentation", "effect of a lesson", and "evaluation of a lesson". These are related to each. For example, it is related to a good result with evaluation of a lesson to carry out assignments. Moreover, since it is a good lesson, it is connected to a seafarer's hope of employment. Moreover, since it is a good lesson, it is connected to a seafarer occupation hope.

About the students' evaluation to a lesson, a hypothetical example was drawn from this category related figure as follows. "By implementation of the active learning type lesson, various thinking and ideas could be known by the exchange of opinion within a group and the presentation to whole, and it was substantial, and was a pleasant good lesson". Since many time of the presentation was prepared and thinking of the others and an idea were known, we surmised that it became a more effective lesson.

The following could be considered In order to improve the lesson. (1) Examine the content of the actual cases. (2) As more exchanges of opinions are made, a four-person group is probably best. (3) A lot of time is needed to prepare for the presentation.

On the other hand, there was the statement "it was boring" in a student's comment.

Although the reason for this was unknown, it is necessary to continue the investigation for improvements. The one student who assessed the lesson as "very bad" commented that "we needed to be trained so that ideas could be created". Therefore, this comment is also reflective of the lesson contents and provides a valuable suggestion, indicating that when designing such active learning lessons, it is necessary to consider the students' ability to think creatively. Further, theme presentations focused on student interests could also be a further improvement. Therefore, these areas need further study.

Table 2　Example of the Coding for the First Lesson (2)

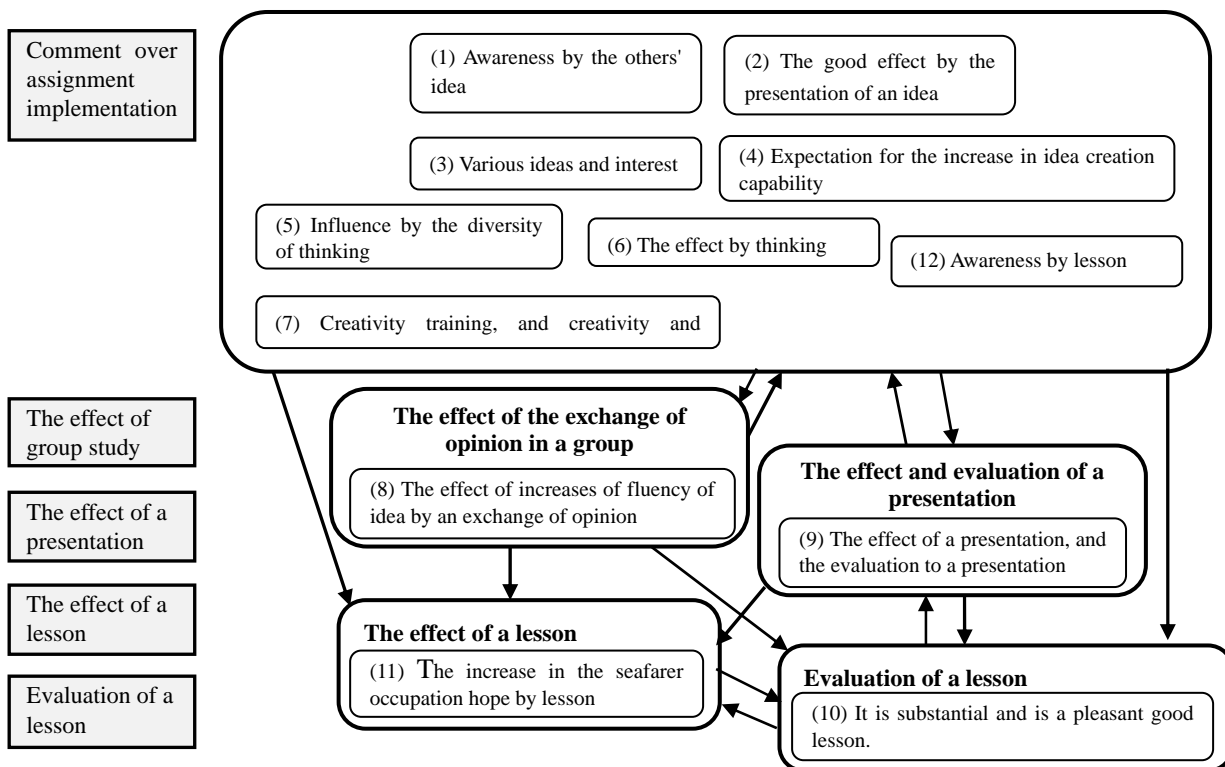| No.	Data	Property	Dimension	Label name
1	·It was good to know the others' various ideas. ·I thought that it needed to be trained for idea creation. ·Hearing others' idea, making the presentation of my own idea, and all were beneficial. ·The idea about a ship is interesting. ·I would like to create the idea which is not caught by common sense.	·The various ideas ·Idea creation training ·The effect which makes the presentation of an idea ·The idea about a ship ·Expectation for the improvement in idea creation capability	·The good effect by the others idea ·The good effect by a presentation ·The needs for idea creation training ·The increase in the interest to the diversity of an idea (especially ship relation) ·Desire increase to idea creation capability	(1) Awareness by the others' idea (2) The good effect by the presentation of an idea (3) Various ideas and interest (4) Expectation for the increase in idea creation capability
2	·I was impressed by the diversity of thinking. ·I thought that thinking was good as training of brains. ·I was pleasant by thinking about many things.	·Diversity of thinking ·The effect by thinking	·The increase in the diversity of thinking ·A good effect increases by thinking.	(5) Influence by the diversity of thinking (6) The effect by thinking
3	·I thought that thinking was important for creativity. ·I was able to train creativity by this lesson.	·Relation between creativity and thinking ·Creativity training	·Close relation between creativity and thinking ·Creativity reinforcement	(7) Creativity training, and creativity and thinking
4	·It was good to have an opportunity to talk with other students by this lesson. ·I was able to consider the good idea by the exchange of idea. ·It was good to hear the opinion of the others.	·An exchange of opinion and an idea ·The effect of an exchange of opinion	·An exchange of opinion and the increase of the fluency of idea ·The increase of effect by exchange of opinion	(8) The effect of increases of fluency of idea by an exchange of opinion
5	·Since other persons' idea was heard, the presentation was good. ·The presentation of other groups was interesting. ·I have been tense to make a presentation.	·The effect of a presentation	·The good effect increase by a presentation	(9) The effect of a presentation, and the evaluation to a presentation
6	·It was the substantial lesson. ·It was a good lesson. ·It was a pleasant lesson. ·It was pleasant at the lesson which is not usually. ·It was the lesson which wants to come to become a seafarer.	·Evaluation to this lesson ·Seafarer occupation hope	·The result of the evaluation to this lesson ·The increase in seafarer hope	(10) It is substantial and is a pleasant good lesson. (11) The increase in the seafarer occupation hope by lesson
7	·I noticed that I was inflexible in my head.	·Awareness to oneself	·Flexibility of one's own head	(12) Awareness by lesson

Figure 6   Categorization Using GTA (2)

5. Conclusion

Two active learning-type lessons were conducted with Tokyo University students and the effect was investigated. In the student assessment of these lessons, about 60% to 70% of students felt that the lessons were good. By giving the students an opportunity to give a presentation, this positive evaluation rose by about 10%. The effect of exchanging opinions in pairs or groups was found to be a positive contributor to the "good" assessment. The assessment and comments indicated that the students enjoyed giving presentations based on their own opinions and ideas.

As part of the assessment, the students were encouraged to give detailed comments, on which a qualitative analysis using GTA was performed. From this analysis, the following hypothesis was drawn. "There were effects, such as the creation of an idea, from the free-flowing exchange of opinions in groups of a small number of people, and it was a pleasant and intelligible lesson", "By implementation of the active learning type lesson, various thinking and ideas could be known by the exchange of opinion within a group and the presentation to whole, and it was substantial, and was a pleasant good lesson", which will form the basis of further study. To achieve the desired outcome from a lesson, I feel that comprehensive "debriefing" is necessary. With this in mind, I would also like to verify the effect of "debriefing" in further study.

Acknowledgment

References

Central Council for Education reply (2012). "Turn to qualitative conversion of the university education for building the new future", — The University which continues learning and raises the capability considered actively throughout life.

Akifumi Kobayashi (2015). "Active learning introduction-active learning changes a lesson and a student", SANNO Institute of Management Publication dept.

Kayo Matsushita et al. (2015). *Deep Active Learning—In Order to Make a University Lesson Enhance*, KeisoShobo.

Masakazu Kanbe et al. (2012). "A discussion of qualitative research strategies application for office work", The Japanese Society for Artificial Intelligence, www4.atpages.jp/sigksn/conf10/SIG-KSN-010-03.pdf.

National Institute for Sea Training (2011). "Mid-term objective and mid-term plan", accessed 1 February 2016, available online at: http://www.kohkun.go.jp.

Shinichi Mizogami (2014). *Conversion of Active Learning and a Lesson Study Paradigm*, Toshindo.

Yasuhito Kinosita (2003). *Practice of Grounded Theory Approach*, Kobundo.

Yasuhiro Sekiguchi (2013). *The Qualitative Analysis Method Lecture*, Kitaojishobo.