

Shared reflection activities for fostering academic emotion and attitude skills in information studies

Atsushi Hirata, Tomoharu Kawaji, Kiichi Amimoto, Kenji Watanabe

Abstract: In this study, we sought to clarify how activities for learning the content of peers' self-reflections and self-assessments affect the development of Japanese high-school students' academic emotion and attitude skills during a unit of Information I, a required course that explores information technology. To that end, we proposed a cycle of reflection, sharing, and evaluation and practiced it throughout the unit. Learners in the experimental group participated in reflection-sharing activities with peers and learners in the control group did not share their reflections with peers. Their responses to LMS delivered pre- and post-practice questionnaires were read by instructors from quantitative, qualitative, and affective perspectives. A comparison of the results suggests that shared self-reflection activities can effectively increase learners' awareness of connections between their learning and their lives, their interests, and their own improvements and transformations.

1. Introduction

1.1 Location of the problem

The Commentary on the Courses of Study for Senior High Schools in Japan organizes the qualities and abilities to be cultivated in each school subject into three pillars 1) the ability to move toward learning and toward human nature, 2) knowledge and skills, and 3) the ability to think, judge, and express oneself (MEXT 2018). This highlights the need to nurture not only traditional academic skills but also academic emotion and attitude skills in the context of each subject's study system. It is also important to nurture human nature and the ability to learn during study so that the student can find out "how to relate to society and the world and lead a better life" (MEXT 2015). This study focuses on learners' need to develop academic emotion and attitude skills and on establishing methods for them to evaluate such skills on their own. Specifically, we sought to clarify how activities for learning the content of peers' self-reflections and self-assessments affect the development of Japanese high-school students' academic emotion and attitude skills during a unit of Information I, a required course that explores information technology.

In a previous study on emotions and attitudes in an information course in the field of information science, Inagawa et al. (2019) conducted a formative assessment and portfolio class practice using rubrics and journal writing and found the following: "By accumulating what they have learned,

having them reflect on it, and giving them appropriate feedback as a formative evaluation, we have been able to encourage children to reflect on what they have learned, to objectify their own learning, and to motivate them to learn more" (Inagawa et al. 2019). However, the content of such reflection activities were not shared among the learners. As it is difficult to know the learning and perspectives of others, the challenge is to facilitate such knowledge in practice. Sharing reflections is one way to meet this challenge.

The reflection activities used in the present study to foster academic emotion and attitude skills have been proposed in many previous studies but only between individual learners and their instructors. There have been few studies on reflection activities where reflections and self-assessments are shared among learners. One reasons for this may be based on the idea that emotions and attitudes should be assessed privately by the individuals who experience them.

1.2 Academic emotion and attitude skills and the existence of others

Matsumoto et al. (2015) conducted a study in art classes on the relationship between fostering academic emotions and attitudes and knowing the learning and perspectives of others. They observed that when students interact with one other "they are trying to feel the attitude and motivation of their creations by comparing themselves" (Matsumoto et al. 2015). Their results suggest that interaction with peers has an impact on the development of academic emotion and attitude skills.

1.3 Purpose of the study

The purpose of this study is to examine the impact of activities for learning the content of peers' reflections and self-evaluations on the development of academic emotion and attitude skills in a unit of Information I. To that end, we first proposed a cycle of reflection-sharing activities and evaluations. The next step was to develop an LMS learning environment to realize the proposed cycle. Then, we read and analyzed the changes in the content of pre- and post-questionnaires throughout the unit, as detailed below.

2. Methods

2.1 Suggestions for Reflection Sharing Activities

To foster academic emotions and attitudes, we propose implementing the cycle of learning activities and evaluations shown in Figure 1 throughout the unit. First, at the end of the n th lesson, learners should be asked to reflect on what they have learned in the lesson (Figure 1, ①), using the LMS. The items prompting reflection are shown in Table 1. For the item "What I thought," students reference the evaluation rubric in Table 2, (created with reference to Inagawa 2019) and assign themselves a letter grade (Figure 1, ②).

Next, by the $n+1$ st class, the instructor evaluates each learner's "thinking" in their reflections based on the rubric (Table 2). Learners' responses to the "What I thought" prompt and their self-evaluations are compiled in list form for each class, edited to mask the writers' identities, and then made available to all learners in the class (Figure 1, ③).

Then, in the introduction of the n+1st class, the learners view the list. By reading their own and others' reflections, learners can reflect on what they learned in the previous lesson, encounter new questions, and make connections between what they learned in the lesson and real life (Figure 1, ④).

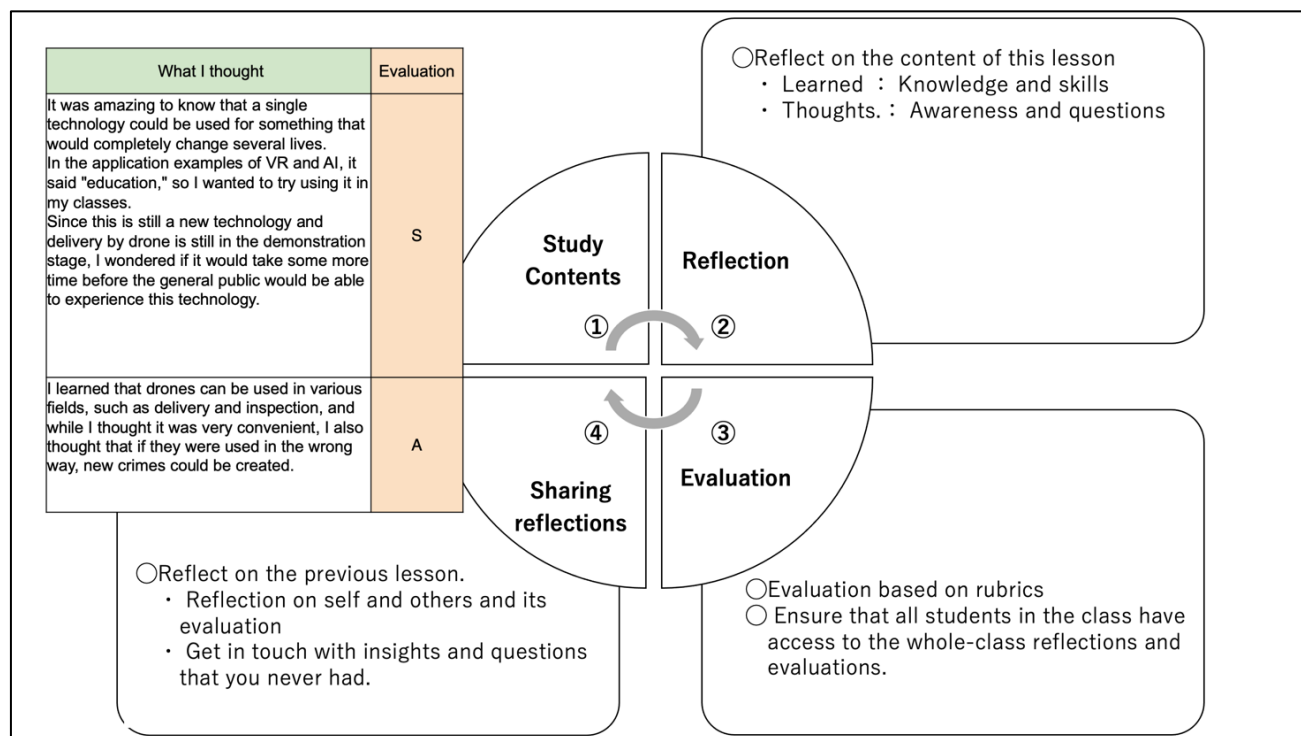


Figure 1. Cycle of learning activities and assessment

Table 1 .Items for Reflection

Item	Prompt
Theme of this hour	Set a theme for reflection on your own
Comprehension of the lesson at this time	Enter your self-evaluation of your understanding of the class on a 5-point scale.
What I Learned	Describe what you have learned and what you are now able to do, in specific, bullet-point form.
What I thought	Describe in detail what you have wondered, what you would like to know more about, and what you have noticed in relation to real life.

Table 2 .Reflection Assessment Rubric

Evaluation Perspective	What I thought
Evaluation Criteria	Students are able to describe what they have noticed and wondered about throughout this study, giving specific reasons.
S	Students are able to describe what they have noticed and wondered about throughout this study and relate it to their real lives and past experiences, giving specific reasons.
A	Students are able to describe what they have noticed and wondered about throughout this study, giving specific reasons.
B	Students are able to describe what they have noticed and wondered about throughout this study.
C	Students are not able to describe what they have learned or thought about throughout this lesson.

2.2 Subject of the study

The present study was conducted with 156 second-year students (four classes) at a high school affiliated with the University of H, F.

2.3 Outline of the practice

From June to July 2020, we conducted the practice through the school-set subject "Introduction to Information Science Research" (2 credits) during the unit "Problem Solving in the Information Society" (7 sessions in total), which is part of Information I, a required course (MEXT 2018). Specifically, a 5-minute reflection activity was conducted in each of the first through seventh sessions for the experimental and control groups, and a 3-minute reflection sharing activity was conducted in each of the second through seventh sessions for the experimental group only.

The purpose of the unit is for students "to think about their relationship with information society and the usefulness of information technology for discovering and solving problems," and it is positioned as an introduction to other units. Fostering human nature and the ability to learn in this unit can lead students to think independently about the characteristics of the society in which they live, the role of technology in it, and what this means for themselves and others.

2.4 Practice environment

The practice was conducted in a classroom permanently equipped with 42 desktop PCs (OS: Windows 10), 24 presentation monitors between the desktop PCs, one large screen, and one projector. To realize activities for sharing reflections, we used G Suite for Education, a cloud-based LMS. To develop the class support environment shown in Fig. 2, we used the Google Classroom,

Google Sites, Google Forms, and Google Spreadsheet applications.

Using the Google Sites website creation tool, we created a web portal for the class that could be viewed by all class members. Next, we used the Google Forms questionnaire creation tool to create a reflection form that could be accessed by learners from the class portal site. After they completed and submitted the forms, their reflections were stored and then output as a tabular file (Google Spreadsheets) as feedback from the instructor, which was then posted on the portal site for the whole class to view.

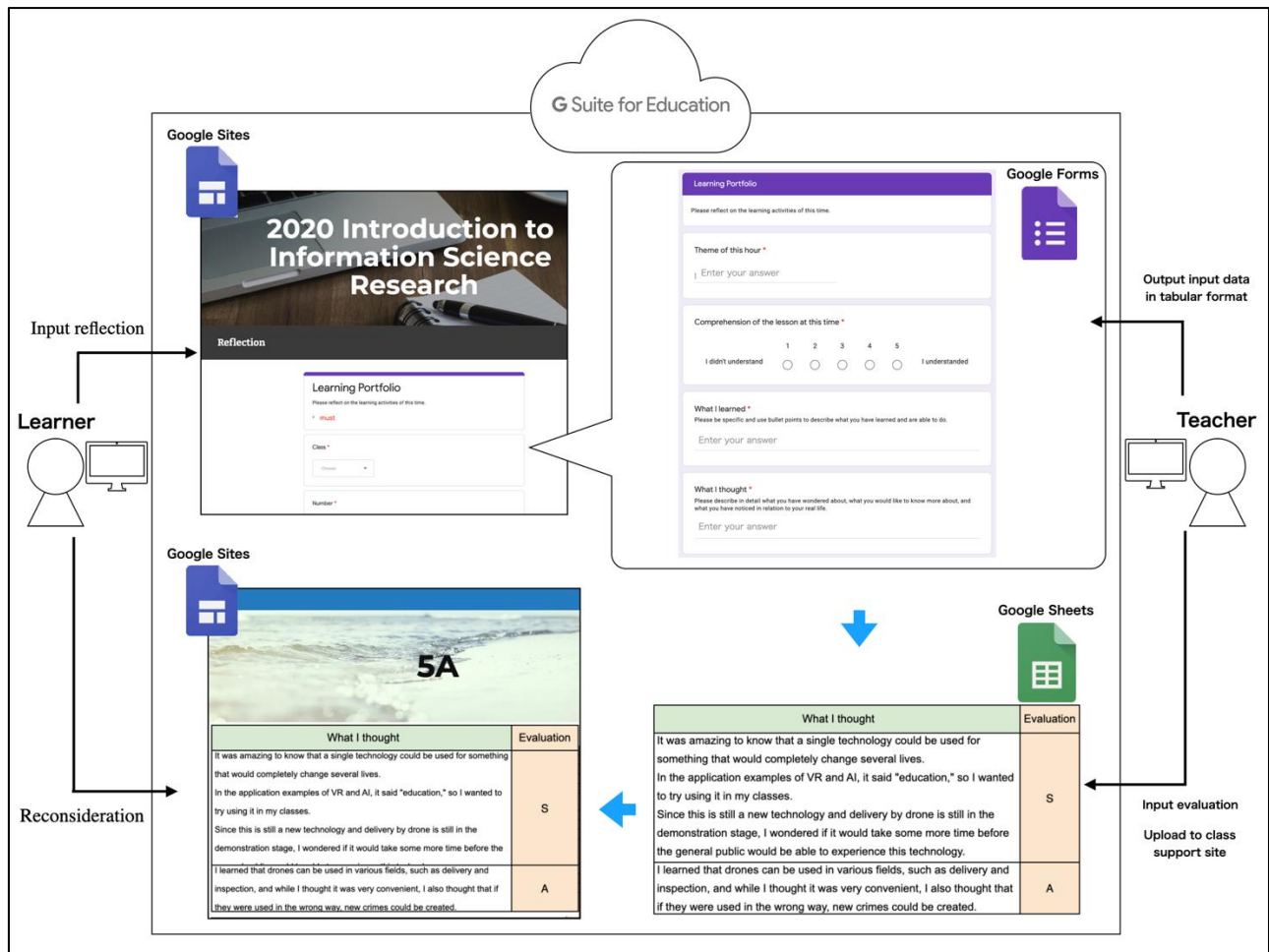


Figure 2. Classroom support environment in place

2.5 Method of analysis

In this study, we examined the impact of reflection sharing activities on the development of learners' academic emotion and attitude skills in two Information I classes (the experimental group). Two classes covering the same Information I unit participated in reflection activities but practiced typing instead of participating in the reflection-sharing activities (the control group). There were no other differences in the learning activities of the two groups (Table 3).

In both groups, pre- and post-practice questionnaires were administered (Figure 3). Students had 10 minutes to answer the question, "What do you think of when you hear the phrase 'problem solving in the information society'?" From the content of the questionnaires, the researchers

determined whether academic emotion and attitude skills had been fostered, referring to Ozaki and Nakamura's (2006) criteria, as detailed below.

Changes in the descriptions in the pre- and post-practice questionnaires were read in three stages: first for quantitative changes, then for qualitative changes, and then for affective change. Changes in quantity were read as increases or decreases in the amount of description. Changes in quality were measured by the presence or absence of specific learning content, by whether the learner's awareness matched the unit's objectives, and by the presence or absence of descriptions of changes in perspective (Table 4). Affective changes were read in terms of the presence or absence of sensory descriptions such as the connection between the learning content of the unit and daily life, descriptions of interests, and descriptions of personal improvement and transformation (Table 5).

The readings were then classified as follows: Category A includes descriptions in which qualitative and affective changes were observed, regardless of whether quantitative changes were observed. Category B includes statements that demonstrated qualitative change but not affective change, regardless of whether quantitative change was observed. Category C includes descriptions in which no changes in quantity, quality, or affect were observed. Ozaki and Nakamura's (2006) found that when the amount of description decreases because a word has become a sentence, the reading is based on the change in "quality", not the change in "quantity".

The results of the classification were cross-tabulated between the experimental and control groups, and a chi-square test was conducted at 5% significance. To confirm the strength of the linkage between groups and categories, the linkage coefficient of the clamor was calculated. For the control group, six reflections were shared after the post-practice questionnaire due to ethical considerations.



Pre- and post-questionnaire

Solving Problems in the Information Society

What do you think of when you hear the phrase "solving problems in the information society"?

There is no word limit. Please write freely.

Please enter your answer

Figure 3. Pre- and post-practice questionnaire

Table 3 . Differences in learning activities between the experimental group and the control group

Experiment group (2 classes, 79 people)	Control group (2 classes, 77 people)	Time
Reflection sharing activities	Typing practice	3min.
Learning activities for each period	Learning activities for each period	42min.
Reflection activities	Reflection activities	5min.

Table 4 . Qualitative change readings

Type of description	Learner's descriptions
Descriptions of specific learning and awareness that meet the objectives of the unit	<ul style="list-style-type: none"> • By using AI to do things that only we humans can do, for example kanji conversion systems, robot vacuum cleaners, and automated driving, AI will function as a solution to all kinds of problems, including high labor costs and time-related issues. • In order to solve problems in today's information society, we first need to be able to organize information. One effective way to do this is by summarizing your thoughts on the information using a mind map. • Specific applications include drones for spraying pesticides in fields and rice paddies to help people engaged in agriculture, many of whom are elderly, and to work more efficiently than people can. By reducing such burdens, prejudices and preconceptions about agriculture will be eliminated, which may deter effects of aging among agricultural workers.
Description of change in perspective	<ul style="list-style-type: none"> • During the slide presentation, points that I hadn't noticed before were pointed out by the peer evaluation, which I will refer to in future reports and slide presentations. • Before, I was proposing solutions to "problems in the information society," but now I'm coming up with solutions to existing problems using "things created in the information society." • Before I studied this unit, I had been thinking about the prevention of personal information leakage and the authenticity of information. These problems have existed for a long time and solutions still need to be improved, but I also felt that we must face the new problems that have been created by the birth of new information technologies such as AI, drones, and VR that I learned about this time.

Table 5 . Affective change readings

Type of description	Learner's description
<p>Connections between the content of the unit of study and daily life, interests, and the like.</p> <p>Sensory descriptions</p>	<ul style="list-style-type: none"> • The use of drones to observe damage and VR as a resource for future disaster drills will bring great benefits to society in terms of disaster prevention and mitigation. • In isolated areas, the supply of water and electricity will often be the first problem. With the drone delivery method, residents of isolated areas can order things like water and mobile batteries via the Internet. I think that it is possible for drones to carry these items. And I thought that people who take medication on a daily basis could have it sent to them via drone as well. • I took up the issue of musical instrument lessons at the Corona disaster as a problem and thought of using VR as a solution.
<p>Description of personal improvement or transformation</p>	<ul style="list-style-type: none"> • I decided to reevaluate whether I am using the Internet in a way that shows awareness of how risky it is to post information. • The techno-anxiety I had was relieved a bit by this information class. • Through the classes I have taken so far, I have learned that even if I think something is easy to understand, it can be difficult for others to understand. And now I can think about designs that are easy for all people to understand.

3. Results

To clarify whether shared reflective activities conducted in the Information I classes affect the development of academic emotion and attitude skills, we analyzed the results of the responses to the pre- and post-practice questionnaires. Of the 156 learners in the study, 139 who responded to both pre- and post-practice questionnaires were included in the analysis. Table 6 shows the results of our readings of the pre- and post-practice questionnaires in both groups. A chi-square test was conducted on the number of items in each category for both groups, and a significant difference was found at the 5% level for category A ($\chi^2(2)=5.585$). The linkage coefficient of the clamor was $V=0.191$.

Table 6 . Results of pre- and post-practice questionnaire readings

Category	Experimental group n=73	Control group n=66	<i>p</i>
A	43	27	0.018*
B	18	24	0.121
C	12	15	0.259

* $p \leq 0.05$, chi-square test

4. Discussion

In this study, we examined the effects of activities for learning the content of peers' reflections and their self-evaluations on the development of academic emotion and attitude skills in the Information I classes. The results showed a significant trend at the 5% level, indicating that the practice conducted with the experimental group was more effective than the practice conducted with the control in terms of increasing students' awareness of the connection between the learning content and their lives, their interests, and their own improvements and transformations. This can be attributed to the fact that the LMS-based cycle of shared reflection activities and shared self-evaluations enabled formative interaction with other learners. This result is consistent with the findings of Matsumoto et al. (2015).

In the control group, learning activities were less likely to lead to affective change than learning activities in the experimental group. This is in part because the control group had to proceed with their studies based on their own experience and understanding alone, which made it difficult for them to become interested in the study content. In addition, it may have been difficult for those students to gain awareness of their own improvement and transformation simply by reflecting on their own learning content.

5. Conclusions

In this study, in order to examine the impact of shared reflection activities and shared self-evaluations on the development of academic emotion and attitude skills in Information I classes, we practiced a cycle of activities to share reflections and evaluations among classmates using an LMS. The results of the readings of the pre- and post-practice questionnaires suggested that activities for learning about the reflections of others and their evaluations may effectively increase students' awareness of the connection between learning content and their lives, their interests, and their own improvements and transformations.

Finally, we present three issues for future study. First, identification of specific reflections that promote affective change in others is needed. In this study, we examined the impact of reflection-sharing activities on the development of academic emotion and attitude skills but not on what kinds of reflection content promotes affective change. It may be possible to analyze the content of the reflections for each class session and identify reflections that strongly influence the content of others' reflections.

Second, formative analysis of the content of the reflections should be undertaken. In this study, affective changes were read through summative analysis, but changes in the content of individual reflections were not read. A formative qualitative analysis of the content of the reflections, may clarify how learners incorporated the learning and perspectives of others into their own.

Third, to test the generalizability of these findings and further examine the influence of shared-reflection activities, it is necessary to reduce unit-specific bias by implementing the same practices in other units of Information I and in other classes.

References

MEXT.(2015). Arrangement of issues.

https://www.mext.go.jp/a_menu/shotou/new-cs/_icsFiles/afieldfile/2017/09/28/1396716_1.pdf.

MEXT.(2018). The Commentary on the Courses of Study for Senior High Schools.

https://www.mext.go.jp/content/20200716-mxt_kyoiku02-100002620_1.pdf.

Takashi Inagawa, Koji Katsuta, Atsushi Hirata.(2019). Formative Assessment and Portfolio Journaling Using Rubrics in Information Studies. *Research on Intelligence Education 2019*, pp. 29-32.

http://www.sigise.jp/iseeps/000_rise2019_all_v101_b.pdf.

Hiroko Matsumoto, Shinichi Matsuzaki, Masazo Uchida, Kazushi Nakamura.(2015). Improving Instruction and Evaluation to Foster "Interest, Motivation, and Attitude Toward art" Through Metacognition. *Hiroshima University Faculty and Affiliated Schools Joint Research Institute Research Notes*. No. 43, pp.247-256.

https://ir.lib.hiroshima-u.ac.jp/files/public/3/37564/20150612104056624566/AnnEducRes_43_247.pdf.

Makoto Ozaki, Yuji Nakamura.(2006). A Study on the Evaluation of Interest, Motivation and Attitude in Junior High School Technology Studies Research. Yokohama National University, Faculty of Education and Human Sciences, *Minutes 1 Educational Sciences 8*, pp. 169-185.

https://ynu.repo.nii.ac.jp/?action=pages_view_main&active_action=repository_view_main_item_detail&item_id=157&item_no=1&page_id=59&block_id=74.