

Collaborative Research on Applying the Graphic Organizer as an Instructional Method ~ A Case Study of In-Service Training for Developing Higher Order Cognitive Skills for Chinese Elementary School Teachers ~

Makiko Kishi

Meiji University, Japan

Kikuko Miyake

Kansai University Elementary School, Japan

Kenichi Kubota

Kansai University, Japan

Li Kedong

South China Normal University, China

The objective of this research is to clarify the process of how Chinese teachers apply an instructional method for developing children's higher order cognitive skills in their classes. The authors conducted collaborative research between Japan and China and worked on developing instructions for higher order cognitive skills in primary schools. As a result, the authors clarified that the teachers in both countries recognize the graphic organizer as effective tools for visualizing the cognitive process and useful in employing them in the classroom. At the same time, Chinese teachers used the graphic organizer differently from that of Japanese teachers.

Keywords: Higher Order Cognitive Skill, Graphic Organizer, Collaborative Research

Introduction

Learners are required to acquire higher order cognitive skills rather than simply remembering facts in 21st-century education. However, many elementary school teachers have taught in a traditional manner, mass teaching, by instructing learners to memorize facts. Memorization is located at the bottom of the pyramid in Bloom's Taxonomy (1956). Teachers need to improve their teaching skills to teach higher order cognitive skills, such as creating, evaluating, and analyzing as shown in Figure 1 (Ralph, 2005). Educational experts have developed the skills and knowledge learners need to succeed in life and work to attain 21st-century learning outcomes, such as key competencies (OECD, 2003) and 21st-century skills (ACT21S). The Central Education Council (2008) in Japan recommended that teachers use "higher order cognitive skills such as comparing, categorizing, and connecting" in elementary schools. Taizan and Miyake (2013) and Taizan, Kojima, and Kurokami (2014) explained that it was important to teach the higher-order cognitive skills in a systematic manner.

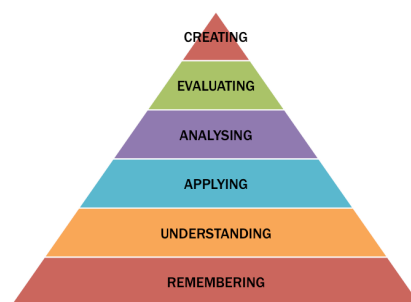


Figure 1. *Bloom's Revised Taxonomy (based on Krathwohl, 2002)*

Teachers at Kansai University Elementary School in Osaka, Japan selected six graphic organizers appropriate for elementary students to enhance thinking practices in various subjects since 2011. The teachers published four books that explained how to teach the skills to disseminate these instructional methods in Japan (Kansai University Elementary School, 2012; Miyake, Taizan, & Kubota, 2012).

These instructional methods can be transferred not only to Japanese elementary schools, but also to other countries, such as China. The authors at Kansai University (KU) and South China Normal University (SCNU) have collaborated since 2012. They decided to disseminate instructional methods that use graphic organizers to Chinese elementary schools. Therefore, the purpose of this study is to ascertain how to effectively transfer instructional methods that use graphic organizers to develop thinking skills at Chinese elementary schools.

Research Background

Education in China has also been very traditional. Cramming is the main technique of learning at Chinese schools because students need to pass entrance examinations to enroll in better educational institutions. The Chinese government published an article concerning educational innovation and development in 1993. To improve exam-oriented education, the Chinese government promulgated “guidelines on the development and reform of China's education,” (The Council of Local Authorities for International Relation, 2008), and proposed “quality education” as educational innovation. Quality education means that schools need to provide high-quality education for children to acquire higher order cognitive skills such as creativity and critical thinking. Achieving quality education became a slogan that promotes the reform of primary and secondary education in China. Cross-curricular learning, “Integrated Practical Study,” was introduced in 1998 for developing a whole individual as a pathway to quality education (Japan Science and Technology Agency, 2013).

Japanese educational reform has also moved in the same direction during this time. Educators were interested in competency, which the Programme for International Students Assessment (PISA) attempted to measure (Tatsuta, 2014). Competency is not defined by an amount of knowledge, but by attaining higher order cognitive skills. The Japanese government also focused on higher-order cognitive skills to make learners think deeply rather than simply memorizing. A new curriculum, called “the course of study,” included teaching higher order cognitive skills at the primary level, so Japanese teachers shifted toward nurturing thinking skills. From these movements in China and Japan, both countries are focused on designing lessons to help students think deeply and learn autonomously.

Since teachers do not have enough experiences in teaching that focused on nurturing higher order thinking, they looked for instructional methods that applied to their classrooms. With such strong needs, Japanese teachers examined various instructional methods for nurturing higher order thinking such as a jigsaw method, a type of group project-based learning (Toyama, 2003); a balloon method in which students write their thinking process in speech balloons in mathematics (Kameoka & Komoto, 2014); and graphic organizers (Kansai University Elementary School, 2012; Miyake, Kishi, Kubota, & Li, 2013; Miyake & Taizan, 2014).

Kishi, Kubota, and Ito (2012) insisted that these instructional methods should make sense to students so that they can relate what they learn to their everyday lives. Teachers in Japan and China may use different teaching strategies, which are suitable for each person's social and cultural contexts, or teachers may employ them

differently even though they use the same strategies. Nu Nu Wai, Kubota, and Kishi (2010) concluded that new teaching strategies introduced by Japanese experts may not work well in other countries because of differences in social and cultural contexts.

Research Objective

The objective of this research is to clarify the process of how Chinese teachers apply an instructional method for developing children's higher order cognitive skills in their classes. In this case, the authors attempted to transfer instructional methods developed in Japanese schools to Chinese schools. The instructional method is called “six graphic organizers” developed at Kansai University Elementary School over four years.

The research questions are:

- (1) How do Chinese teachers change their teaching practices after they learned the instructional methods of how to apply the graphic organizers in class?
- (2) How do Chinese teachers use graphic organizers differently from Japanese teachers? Or In what ways do Chinese and Japanese teachers use graphic organizers differently?

To answer these research questions, the authors initiated collaborative research between Japan and China on designing instruction to develop higher order cognitive skills in primary schools.

Methodology

Outline of the workshop

The authors introduced instructional methods for developing higher order cognitive skills to Chinese elementary school teachers through the workshop in Guangzhou Province, China to learn how to use the graphic organizers as “innovation” for Chinese teachers. After the workshop, the authors received feedback from the teachers through interviews and questionnaires.

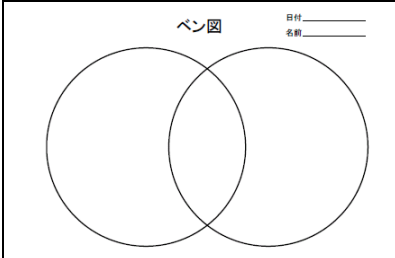
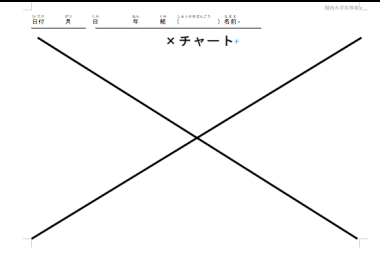
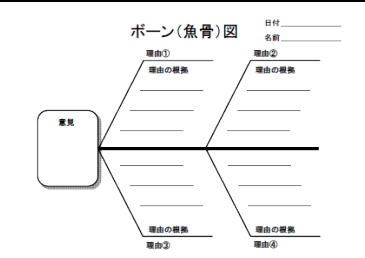
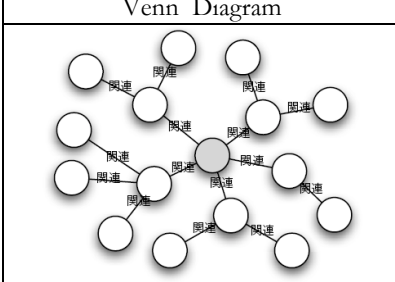
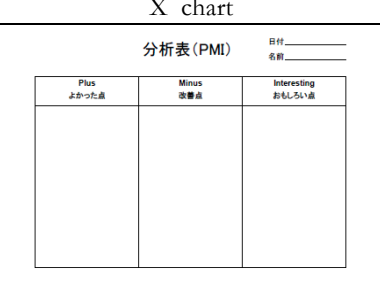
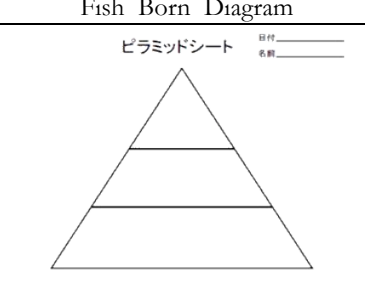
The Japanese authors visited China three times: September 2012, March 2013, and March 2014 (see detail in Table 1) to conduct the workshops. About 35 Chinese teachers from three elementary schools in Guangzhou participated in the workshops. They learned how to use the graphic organizers in class at the first workshop. After the first workshop, they used the graphic organizers in their teaching. When the Japanese researchers visited in March 2013, they observed classroom activities and discussed how to teach effectively with the teachers who participated in the first workshop. In the second workshop, new teachers from three other schools participated. The Japanese authors conducted the third workshop in March 2014, in which teachers from six elementary schools participated.

The Japanese authors introduced the graphic organizers shown in Table 2. These graphic organizers are used to organize logical thinking and articulate a student's thoughts. It is important for students to visualize their thinking process to clarify their logical explanations. It enables Chinese teachers to change their way of teaching from asking students to memorize to letting them think critically by themselves.

Table 1. *Outline of the Workshops*

| | The 1st workshop | The 2nd workshop | The 3rd workshop |
|--------------|---|---|--|
| Objective | To understand how to use the graphic organizers in class based on the case studies of Kansai University Elementary School and design teaching strategies with graphic organizers. | To solve problems that Chinese teachers faced when using graphic organizers for thinking skills development in primary education. | To reflect on their own practice through group discussion by filling in good points and points needed for improvement in the PMI sheet. |
| Activities | The authors introduced how to use graphic organizers in class. Chinese teachers worked on some activities using two graphic organizers. | Chinese teachers reported their experiences using the graphic organizers. The authors advised teachers how to improve their teaching practices. | The authors conducted a workshop about Case Based Reasoning (Aamodt & Plaza, 1994). The seven cases were prepared based on class observations by the authors and SCNU such as how to evaluate students' thinking, how to support students to receive multiple viewpoints, and how to set up learning goals in thinking activities. Teachers also reflected on their own practices from PMI viewpoints. |
| Date | 2012/9/8 | 2013/3/28 | 2014/3/28 |
| Place | Guangzhou Educational Center | South China Normal University, Guangzhou, China | South China Normal University, Guangzhou, China |
| Participants | About 25 teachers, staff of Guangzhou Educational Center and graduate students | About 30 teachers, staff of Guangzhou Educational Center, and graduate students | About 30 teachers, staff of Guangzhou Educational Center and graduate students |

Table 2. *Graphic Organizers Introduced to Chinese Teachers.*

| | | |
|---|---|---|
|  |  |  |
| Venn Diagram | X chart | Fish Bone Diagram |
|  |  |  |
| Concept map | PMI sheet | Pyramid Chart |

Data collection and analysis

Data was collected as follows.

(1) Interviews and observations

The authors interviewed teachers to clarify how Chinese teachers change their teaching practices after they learned the instructional methods of how to apply the graphic organizers in class. After the workshops, the authors observed classes and discussed with teachers how they used the graphic organizers in class effectively.

(2) A record of reflections in 3rd workshop

The authors analyzed reflection statements about the teachers' experiences to identify how Chinese teachers used the graphic organizers in class. In the 3rd workshop, the authors conducted the following activity to encourage teachers to reflect on their teaching practices:

STEP1: Teachers formed several groups composed of 6-8 members.

STEP2: Teachers shared their teaching experiences with each other.

STEP3: Teachers summarized good and bad points of using the graphic organizers in class.

STEP4: Each group wrote the results of their discussions on paper as shown in Tables 3 to 6.

The authors analyzed the outcomes by comparing how Chinese teachers used organizers differently from Japanese teachers, or how differently each group of teachers put graphic organizers to use.

Findings and Discussion

The process of Chinese teachers changing their teaching practices after learning how to apply graphic organizers in class

During the first workshop, Chinese teachers were excited about learning new instructional methods. They were eager to apply graphic organizers in class. However, some teachers found that students needed more time to develop their ideas than the teachers expected. The teachers said that they could not control the students' behaviors when allowing students to think on their own. The teachers were afraid of uncontrolled chaos in the classroom.

In the second workshop, the teachers reported that they became accustomed to letting students use graphic organizers in class. The teachers realized that using graphic organizers were effective in visualizing thinking. It also allowed students to enjoy using graphic organizers. When the authors visited the schools and observed class activities, the students showed their products using graphic organizers as shown in Figure 2. The students neatly drew the graphic organizers.



Figure 2. Examples of Student Products

In the third workshop, through the group reflections, Chinese teachers shared more details of how to use thinking tools in their classroom as well as their possibilities and difficulties (see detail below under 5.2). They also discussed how to utilize better graphic organizers. The Chinese teachers shared ideas and experiences for occasions when graphic organizers were useful. Through the workshop, it became clearer that the Chinese

teachers paid more attention to using graphic organizers for preparation before a lesson and for reviewing what students already learned. Chinese students enjoyed drawing graphic organizers neatly as well as preparing and reviewing them. The Chinese teachers noticed that students spent more time for preparing and reviewing. The students enjoyed self-learning more than ever before.

All teachers agreed that students could visualize their thinking processes with graphic organizers better than before. The teachers reaffirmed that they would apply graphic organizers in future class activities.

How Chinese teachers used graphic organizers in their classes

Based on group reflection data from four groups (A-D) in the third workshop, the authors identified how the Chinese teachers used graphic organizers in class (Tables 3 to 5).

Table 3. Group A Outcomes

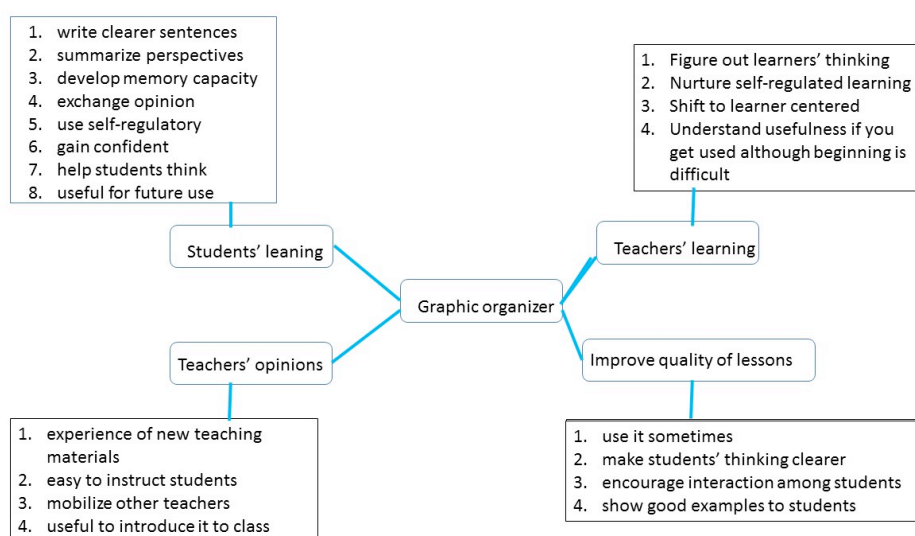


Table 4. Group B Outcomes

| Plus Points | Minus Points | Interesting Points |
|--|---|--|
| <ol style="list-style-type: none"> Teachers can heighten thinking ability. When students develop stories, they produce a wide variety of stories. Students enjoy learning in class. They are strongly motivated. | <ol style="list-style-type: none"> They create stories with the graphic organizer. Their stories are not so interesting in grade 3. Since students have limited vocabulary and grammar, they did not produce new ideas. Example: As there are events about Christmas and New Year in the textbook, students did not create new events other than these two. | <ol style="list-style-type: none"> How we can make all students more motivated? How can we implement both creative thinking and logical thinking together in a Chinese class? How to make good exercises for listening, speaking, reading, and writing with the graphic organizers. In composition class, how to make students develop their thinking skills and not be limited by graphic organizers. |

Table 5. Group C Outcomes

| Plus Points | Minus Points | Interesting Points |
|--|--|--|
| <ol style="list-style-type: none"> 1. Students can think logically. It is effective for preparing Chinese lessons 2. Effective for analyzing characteristics of people who appear in the textbook (grade 5 Chinese) 3. Students can select the graphic organizers based on their preferences. | <ol style="list-style-type: none"> 1. Students care much more about the appearance of the graphic organizers rather than learning itself. 2. Students did not have a clear understanding about the graphic organizers. | <ol style="list-style-type: none"> 1. It is useful to arrange their knowledge and problems. 2. How to instruct those who think more actively. 3. The graphic organizers may sometimes hinder their thinking in mathematics classes. |

Table 6. Group D Outcomes

| Plus Points | Minus Points | Interesting Points |
|---|---|---|
| <ol style="list-style-type: none"> 1. Students can understand essays through the use of graphic organizers. It solved the problems of preparation. 2. Students can analyze distinctive features of characters in a novel by using the fishbone graphic organizer. 3. Students understand relationships among characters in the novel. 4. Students can analyze glass features and utilization by using the fish-bone graphic organizer, and they enjoyed learning. 5. Students apply the graphic organizers to learn classic novels in extra curricula activities. 6. Students easily remember the content because of combination of graphics and writing. 7. Student can grasp the relationship between the overview and the detailed parts just by looking. | <ol style="list-style-type: none"> 1. Students did not think deeply because they just cut and paste the contents. 2. Students focused on drawing rather than the thinking process. It took a long time to complete. | <ol style="list-style-type: none"> 1. Students can understand the characteristics of geometrical figures easily through graphic organizers. 2. Students can develop their imagination. 3. Teachers found students understand better, if the Y diagram was introduced in Math class. 4. Since students enjoyed drawing the graphic organizers by themselves, they did not like to work together. 5. There is not enough time to share their products in class. 6. Some students cannot finish within class time. 7. How do teachers make students solve problems within certain time, and be interested in Chinese? 8. Teachers must consider which graphic organizers fit certain contents. |

The summaries of group discussions (Tables 3, 4, and 5) indicated the following about using graphic organizers: First, Chinese teachers stated that students are motivated to learn with graphic organizers. For instance, Chinese teachers in Group A (Table 3) said, “Students enjoy learning in Chinese class. They are strongly motivated.” Teachers in other groups mentioned that thinking tools motivate students to learn more. On the other hand, there were some students who use graphic organizers incorrectly. They “focused on drawing rather than the thinking process (Table 6)”, and “cared too much about appearances of the graphic organizers rather than learning itself (Table 5)” as shown in Figure 2. It is because “students do not have clear understanding of how to use graphic organizers” as Group B mentioned.

Second, the Chinese teachers identified that students were able to sort out their ideas and organize them using graphic organizers. Therefore, the students were able to understand the lesson contents deeply. At the same time, however, some students just copied and pasted the information from the book and the Internet

into graphic organizers. The teachers in Group A stated, “Since students have limited vocabulary and grammar, they could not come up with new ideas.” The same issue has been reported in the research on graphic organizers in Japan (Kishi, Konno, Sakata, Miyake, Kurokami, & Kubota, 2008). A Japanese teacher mentioned that teachers need to consider the developmental levels of students when students use the graphic organizers. A certain level of linguistic ability is necessary for nurturing higher order cognitive skills.

Third, Chinese teachers had difficulties integrating the graphic organizers into their lessons because of time limitations. Since students take time writing on graphic organizers, it is difficult for teachers to complete lessons within time limits. As shown in Figure 2, Chinese students draw graphic organizers very neatly. In contrast, teachers at Kansai University Elementary School allow students to make use of graphic organizers to help their thinking processes, and not the outcomes of their thinking (Figure 3). Students can think in constructive ways by using the graphic organizers. (Khaw, 2005) Graphic organizers can help students focus on how to think and what to think. Therefore, Japanese students do not intend to complete graphic organizers. They jot down their ideas to grasp the relationship between the overview and the details visually and to add more of their ideas.

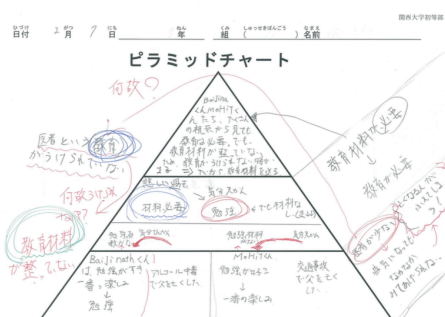


Figure 3. Example of the Graphic Organizer used in Kansai University Elementary School

Conclusions and Future Direction

This research revealed that as Chinese teachers gradually became more familiar with graphic organizers they felt more comfortable using them because the tools supported thinking processes as well as motivated students to learn more deeply.

At the same time, the Chinese teachers used graphic organizers differently from the Japanese. Japanese teachers think that visualizing the cognitive process can help students think more critically, so teachers usually use graphic organizers at the front end. On the other hand, Chinese teachers usually used the graphic organizer for reviewing what students already learned. Therefore, Chinese teachers asked students to use the graphic organizer as assignments for reviewing. Chinese students spent a large amount of time drawing the graphic organizer neatly. In other words, the Chinese teachers applied an instructional method for developing higher order cognitive skills, according to their classroom context.

The authors clarified that teachers in both countries recognized graphic organizers as effective tools for visualizing cognitive processes and useful in employing them in the classroom. At the same time, it is necessary for teachers to consider what kinds of situations learners are in, and decide when to, how to, and why use graphic organizers. Future research will be conducted to determine how to apply graphic organizers in different learning contexts.

References

- Agnar, A., & Enric, P. (1994). Case-based reasoning: Foundational issues, methodological variations, and system approaches. *Journal of AI communications*, 7 (1), 39-59.
- Bloom, B. S. (1956). *Taxonomy of educational objectives, Handbook 1: The cognitive domain*. New York: David McKay Co Inc.
- Japan Science and Technology Agency (2013). *Development and reform of primary and secondary education in China*. Retrieved from http://www.spc.jst.go.jp/investigation/downloads/r_201312_01.pdf
- Kameoka, M., & Komoto, A. (2014). *Balloon method for class design of mathematics—visualizing and understanding pupils' thinking process*. Tokyo: Toyokan-Publishing. (Japanese)
- Kansai University Elementary School (2012). *Thinking methods at Kansai University Elementary School*. Tokyo: Sakura-sha. (Japanese)
- Khaw C. E. (2005). *Thinking smart: You are how you think*. Selangor Darul Ehsan: Pelanduk Publications(M) SDN.BHD.
- Kishi M., Konno, T., Sakata, A., Miyake, K., Kurokami, H., & Kubota, K. (2008). The practice of using thinking tool from the perspective of socio-cultural approach. *Japanese Journal of Educational Technology, JSET08*(3), 11-18. (Japanese)
- Kishi, M., Kubota, K., & Ito, T. (2012). A case study of implementing lesson study for pre-service training for education in Myanmar. *Journal of Educational Technology and Research*, 35, 1-10.
- Kishi, M., & Kubota, K. (2011). How does social norm be transferred in an international cooperation in educational field? Case study of education college in Myanmar. *Journal of International Research Institute for Studies in Language and Peace, Kyoto University of Foreign Studies*, 77, 29-45. (Japanese)
- Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice*, 41(4), 212-218.
- Miyake, K., Taizan, Y., & Kubota, K. (2012). Implementation and evaluation of lessons for nurturing thinking skills at elementary school. *The 28th Japan Society of Educational Technology Annual Conference Proceedings*, 489-490. (Japanese)
- Miyake, K., Kishi, M., Kubota, K., & Li, Kedong. (2013). Analyzing lessons in Chinese primary schools based on Japanese teachers' viewpoints – A case study of nurturing higher order thinking. Retrieved from http://icome2013.iwd.jp/program/pdf/1p_PDF/A04.pdf
- Miyake, K., & Taizan, Y. (2014). Evaluation of curriculum for acquisition and application of thinking skill. *Japanese Journal of Educational Technology*, 38(Suppl.), 41-44.
- Nu Nu Wai, Kubota, K., & Kishi, M. (2010). Strengthening learner-centered approach (LCA) in Myanmar primary school teacher training: Can initial practices of LCA be seen? *International Journal for Educational Media and Technology*, 4, 46-56.
- Ralph, P. (2005). *Improving thinking in the classroom*. Victoria: Hawker Brownlow Education.
- The Organisation for Economic Co-operation and Development (OECD). (2003). The definition and selection of key competencies (executive summary). Retrieved from <http://www.oecd.org/pisa/35070367.pdf>
- Taizan, Y., Kojima, A., & Kurokami, H. (2014). A study of subject-common thinking skill for systematic information education – From analysis of the government curriculum guidelines and commentary to it. *Japanese Journal of Educational Technology*, 37(4), 375-386. (Japanese)
- Taizan, Y., & Miyake, K. (2013). Effects of learning higher ordered cognitive skills in problem solving process. *Japanese Journal of Educational Technology*, 37(suppl.), 17-20. (Japanese)
- Tatsuta, K. (2014). *Practice of key competencies: Teacher as a lifelong learner*. Tokyo: Akashi-Shoten. (Japanese)
- The Central Education Council (2008). Improving the course of study in pre-school, elementary school, lower middle school, upper secondary school and special education school. *Ministry of Education (report)*. Retrieved from http://www.mext.go.jp/a_menu/shotou/new-cs/news/20080117.pdf (Japanese)
- The Council of Local Authorities for International Relations (n.d.). *Chinese compulsory education*. Retrieved from http://www.clair.or.jp/j/forum/c_report/pdf/325.pdf
- Toyama, S. (2003). Study on project-based learning in community media arts projects learning media literacy with community informatics. *Journal of Japan Information-Culturology Society*, 10(1), 31-38.