

ГОДИШНИК НА СОФИЙСКИЯ УНИВЕРСИТЕТ „СВ. КЛИМЕНТ ОХРИДСКИ“
ФАКУЛТЕТ ПО НАУКИ ЗА ОБРАЗОВАНИЕТО И ИЗКУСТВАТА
КНИГА ПЕДАГОГИЧЕСКИ НАУКИ

Том 114

ANNUAL OF SOFIA UNIVERSITY “ST. KLIMENT OHRIDSKI”
FACULTY OF EDUCATIONAL STUDIES AND THE ARTS
BOOK OF EDUCATIONAL STUDIES

Volume 114

FACTORS CONTRIBUTING TO THE “JOY TO LEARN” IN
JAPANESE ELEMENTARY SCHOOLS: A COMPREHENSIVE
STUDY USING QUANTITATIVE AND QUALITATIVE
ANALYSIS

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Abstract. Positive psychology has come to point out the effectiveness of positive emotions. The joy of learning is an important positive emotion that encourages children to continue learning. Therefore, in the first study, we investigated the joy of learning from the child’s perspective and examined the factors that influenced it through quantitative analysis. In the early grades, classroom atmosphere and approval and subjective academic ability, had facilitating effects on the joy of learning. In the upper grades, in addition to the factors mentioned above, social skills and motivation had facilitating effects. Furthermore, it was

found out that the joy of learning decreases as the grade steps up. Therefore, in the second study, we extracted the responses of the sixth graders, who still find joy in learning and did a qualitative analysis. The result showed that they found fun in cooperative learning in Maths. It was discussed from the viewpoints of meta-cognitive development, classroom atmosphere, cooperative learning in various subjects, and the experiences from the inter-group competition.

Keywords: Joy of learning, subjective academic ability, objective academic achievement, motivation, cooperative learning, grade level, meta-cognition, elementary school students, and peer teaching.

INTRODUCTION

With the rise of positive psychology, it has been argued that psychology should focus not only on negative emotions such as anxiety and depression, but also on positive emotions such as pleasures and enjoyment and should examine how these emotions positively affect us. In addition, recently there has been a movement to incorporate such positive psychology into school educational system (Renshaw, Long & Cook, 2015:534; Shobu, Saito & Minami, 2016:47).

Joy is one of the important positive emotions for children to make learning interesting at school. The positive emotions of joy that children experience at school include not only the joy associated with learning, but also other joys, such as the joy of making friends and the joy of playing with friends. Obviously, these other joys outside of the learning process can also have a positive influence on learning. However, the joy of learning is thought to have a stronger influence on children's desire to continue learning than any other joys. If children experience the joy of learning a lot, they will be more motivated to learn, which can lead to independent and continuous learning in the subsequent years. It is "Joy to Learn". Moreover, knowing the joy of learning has the potential to expand children's academic abilities for the future. As mentioned above, the joy of learning has a significant role in children's learning. Therefore, we need to consider the joy of learning.

In the studies of negative life events, there is a concept of dividing negative life events into two domains: task-accomplishing domain and interpersonal domain (Dozois, 2000:118; Li & Sakai, 2011:53). Therefore, it is thought that there may be two kinds of domains in positive experiences as well. In other terms, two types of joy: task-accomplishing and interpersonal. The task-accomplishing joy of learning is the joy that children feel when they can do something, such as solving a difficult problem or running faster than before. Moreover, the results of learning are assessed by tests. Therefore, children may often feel the task-accomplishing joy of learning when they can get good scores on tests.

On the other hand, the interpersonal joy of learning is the joy of doing something in class with others, such as singing a song or making something with friends. Since the joy of learning is experienced in a group setting such as a school or a

classroom, it is likely that children feel not only the joy of learning to accomplish a task or the interpersonal joy of learning, but also the joy of a combination of both. Children sometimes feel the joy of learning that comes from accomplishing something with their peers, such as succeeding in a science experiment with a group of friends or winning as a team in a physical education class. Therefore, in this study, we define “joy of learning” as “the positive emotions about learning that children feel in class, which include both task-accomplishing and interpersonal aspects”.

In Japan, the new Guidelines for the Course of Study have been published recently (Ministry of Education, Culture, Sports, Science and Technology, 2016). It emphasized the need to “nurture people who continue learning throughout their lives, by experiencing the joy of learning, the excitement of creating in cooperation with others and the curiosity to explore, through their studies at schools” (Ministry of Education, Culture, Sports, Science and Technology, 2016:17; Tsuneta, 2018:15). Thus, while the importance of the joy of learning has been pointed out, it has also been pointed out that there are some elementary school students who get stuck in mathematics and feel studying uninteresting, or those who lose their concern about mathematics and science rapidly after the upper grades of elementary school (Yoshie, 2007:37; Inoue & Hashimoto, 2018:3). In addition, according to the results of a Survey by the Ministry of Education, Culture, Sports, Science and Technology (2018), in junior high schools, after interpersonal relationships with friends and family problems, poor academic performance is the next major factor in truancy (24.1%). Furthermore, it has been pointed out that the number of junior high school students who say they do not enjoy their classes is increasing (Kashiwagi & Iwanaga, 2014:69). Considering that learning in junior high schools is based on learning in elementary schools, it is important for children to experience the joy of learning and understanding during their elementary school years. Therefore, it is needed to examine the joy of learning of elementary school students.

In this regard, in Japanese physical education classes in elementary schools it has been focused on the joy and pleasure of physical activity. Recently, the teachers realized the importance of experiencing such joy and pleasure of physical activity before improving abilities and skills for their future lives (Okamura, 2020:123; Sairenji & Watanabe, 2020:116). In addition, there are studies that explore the teaching styles to make students enjoy the understanding of science and mathematics classes (Yamamoto, 2006:147; Sasaki, 2010:109). As shown above, there have been many studies from the teachers’ perspective that focuses on the joy of learning and conducting interesting lessons. However, it is possible that there is a discrepancy between the joy of learning that teachers think children have, and the joy of learning that students themselves feel. Child-centered approach is important in understanding this problem. Therefore, there is a need to study this joy of learning from the perspective of children, as there are few studies from this perspective.

In recent years, some research on the joy of learning from the children’s perspective has been conducted in Bulgaria and other countries (Mirtschewa, 2015).

A study survey has also been conducted in elementary and junior high schools in Japan (Yoshitake et al., 2015:18-28). Yoshitake et al. first asked the children how much they felt the joy of learning and at what point they felt it. They examined what influenced their joy of learning using a questionnaire survey and free writing. Then, as a trial analysis, they took up school size, objective academic achievement, subjective academic ability, and social skills. However, we thought that there are other factors that may affect the joy of learning of children.

First, the economic level of the parents may affect the children's joy of learning. Yagi (2018:68) reported that in Japan there is basically a link between family poverty and low academic performance of children. Therefore, similarly, low parental economic level may be related to low joy of learning of children.

Second, children's motivation may affect their joy of learning. During the six years of elementary school, cognitive development is remarkable. From the viewpoint of Piaget's theory, during the early elementary school years, intuitive thinking, which is characteristic of the pre-operational stage, fades and the concrete operational stage begins. In the upper grades of elementary school, the transition from the concrete operation stage to the formal operation stage begins, and it is thought that children are freed from thinking based on concrete objects and are able to reason with a qualitatively new style of thinking (Nakagaki, 2011:372). As a result of this cognitive development, the enjoyment of thinking is expected to emerge in the upper grades. The joy of thinking in the upper grades may increase their motivation, which may lead to the joy of learning.

Third, factors such as the atmosphere of the class group and the approval by teachers and friends may affect the joy of learning. At school, learning is done in a classroom group setting. Therefore, it is highly possible that the class atmosphere, regardless of the grade level, has a strong influence on the joy of learning in the class. When the class size is small, children are more likely to speak up and teachers are more likely to be involved with the children. However, if the class atmosphere is good, regardless of the size of the class, the children will be able to speak up easily, and the teachers and their friends will have a lot of interaction with the children. Therefore, class atmosphere may have a stronger influence on the joy of learning than class size.

In addition, Sugawara (2018a:33) illustrated his idea that teachers' recognition of elementary school students' small notices and discoveries would lead to their self-competence and joy of learning and thinking. This suggests that approval by the teacher has a significant impact on the joy of learning. Moreover, as the grade level increases, the approval from friends as well as from teachers is expected to increase, and it can be inferred that approval from friends also leads to the joy of learning.

STUDY 1

Based on the above mentioned, in the first study, we will add the factors of parents' economic level, children's motivation, classroom atmosphere, and approval by teachers and friends, as well as the factors taken by Yoshitake et al. (2015:19). Moreover, they did analysis on these factors separately to see if each of them influenced the joy of learning. Therefore, in the first study, we will take the above personal and situational factors and comprehensively analyze which factors have a strong influence on children's joy of learning.

METHOD

The subjects of this study included six hundred and ninety– three elementary students: 368 boys, 324 girls and 1 unknown. The numbers of graders were as follows: 126 second graders (67 boys and 59 girls), 141 third graders (80 boys, 60 girls and 1 unknown), 128 fourth graders (67 boys and 61 girls), 144 fifth graders (70 boys and 74 girls), and 154 sixth graders (84 boys and 70 girls). The subjects of this study also included five hundred ninety students from large classes of city areas and one hundred three students from small classes of rural areas.

Questionnaire survey

1. Children survey items:

Open-ended question

- In what situation did you enjoy or find pleasure of learning in school?

Questionnaire with scales

- one item for children's pleasure in learning,
- two items for children's perception about their own academic ability
- thirty– three items for 2–3 grades and thirty– seven items for 4–6 grades of Hyper-Questionnaire Utilities (Kawamura, 2013). It consisted of the following groups of items (3 items for motivation to learn, 3 items for friendships, 3 items for classroom atmosphere, 6 items for approval and 6 items for infringement for all grades. 12 items for 2–3 grades and 16 items for 4–6 grades for social skills)
- gender, grade.

2. Teacher survey items:

Questionnaire with scales

- each child's academic performance scores of five subjects (Japanese, Maths, Musik, Physical education, Art and craft)
- parents' economic level in their classes
- class size (large or small).

RESULTS

Joy of learning

We asked the children to rate on a four-point scale how much they enjoy learning at school. The result was shown in Table 1.

	total		boy		girl	
	mean	SD	mean	SD	mean	SD
2nd grade	3.634	0.055	3.642	0.542	3.627	0.554
3rd grade	3.581	0.053	3.500	0.598	3.661	0.545
4th grade	3.460	0.055	3.462	0.663	3.459	0.594
5th grade	3.401	0.052	3.343	0.634	3.459	0.601
6th grade	3.325	0.050	3.250	0.758	3.400	0.623
			4:very fun-1:never fun			

On a four-point scale of 4: “very fun” to 1: “not fun at all”, the mean values for second to sixth grade were as follows: 3.634 for second grade, 3.581 for third grade, 3.460 for fourth grade, 3.401 for fifth grade, and 3.325 for sixth grade. The results of the two-factor analysis of variance for grade \times gender showed that there was no gender difference. The main effect of grade was significant ($F(4,677) = 5.817, p < .01$). The results of the subtest showed that the joy of learning was significantly lower in grades 5 and 6 compared to grade 2 (comparison between grades 2 and 5, $t=3.083, df=677, p < .05$; comparison between grades 2 and 6, $t=4.145, df=677, p < .01$. See Figure 1).

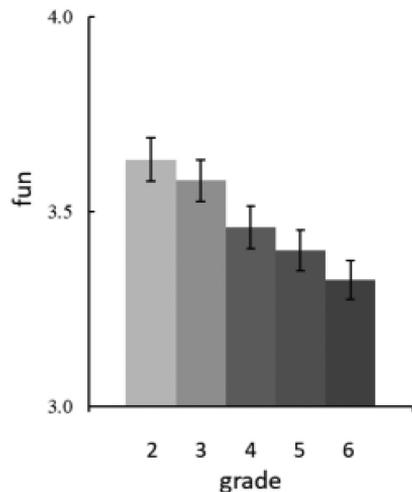


Figure 1 Joy of learning from 2nd to 6th grades

In Japan, the first semester begins in April. When this study was done in June, only two months would have passed since the 1st graders had entered elementary school. Therefore, they had had few experiences in school life, and they were just learning how to write characters. It would have been difficult for them to write about their enjoyable experiences. Therefore, in this study we investigated the data

from the 2nd to 6th graders. In near future, it would be interesting to find out how much the first graders feel about Joy in learning.

COMPREHENSIVE ANALYSIS ON JOY OF LEARNING

Among the variables, the degree to which the students themselves recognize that they are not poor at learning in school and that they can understand the lessons well was named as “subjective academic ability”, as it was their subjective perception of academic ability.

The economic level was calculated on a four-point scale based on the percentage of children in each class who received school subsidies.

In addition, since variables with too high correlation cannot be used as explanatory variables in multiple regression analysis, the following two factors were summarized by principal component analysis. Friendship, classroom atmosphere, approval, and infringement were defined as “classroom atmosphere and approval”. The academic scores of five subjects (Japanese, arithmetic, music, physical education, and arts and crafts) on the report card evaluated by the teachers were defined as “objective academic achievement”.

QUANTITATIVE ANALYSES THROUGHOUT ALL GRADES

Multiple regression analysis was conducted with subjective academic ability, objective academic achievement, social skills, motivation to learn, classroom atmosphere and approval, gender, grade level, economic level, and class size as explanatory variables and joy of learning as the objective variable. Small size, boy, and second grade were used as criteria in multiple regression analysis. The result was shown in Table 2.

Classroom atmosphere and approval ($\beta=0.285, p<.01$) and subjective academic achievement ($\beta=0.191, p<.01$), had facilitating effects on joy of learning. Motivation to learn ($\beta=0.181, p<.01$) was also found to have a facilitating effect on joy of learning. On the other hand, grades 4, 5, and 6 had a suppressive effect on joy of learning ($\beta=-0.114, p<.05$ for fourth grade, $\beta=-0.142, p<.05$ for fifth grade, and $\beta=-0.162, p<.01$ for sixth grade).

Table 2 A multiple regression analysis on joy of learning

variables	β	
large class	-.017	
economic level	.044	
third grade	-.027	
fourth grade	-.114	*
fifth grade	-.142	*
sixth grade	-.165	**
girl	.023	
social skill	.094	
motivation	.181	**
subjective academic ability	.191	**
objective academic achievement	.015	
classroom atmosphere and approval	.285	**
R^2	.366	**
		** $p < .01$, * $p < .05$, + $p < .10$

QUALITATIVE ANALYSIS IN THE LOWER GRADES AND UPPER GRADES

Since it was inferred that the joy of learning decreases in the upper grades, we decided to analyse what factors affect the joy of learning again, separately for grades 2 and 3, and for grades 5 and 6. Multiple regression analysis was conducted with subjective academic ability, objective academic achievement, social skills, motivation to learn, classroom atmosphere and approval, gender, grade, economic level, and class size as explanatory variables, and joy of learning as the objective variable.

The result for grades 2 and 3 was shown in Table 3, where classroom atmosphere and approval ($\beta=0.279$, $p<.01$) and subjective academic ability ($\beta=0.333$, $p<.01$) had facilitating effects on joy of learning.

The result for grades 5 and 6 was shown in Table 4. In grades 5 and 6, as in the lower grades, classroom atmosphere and approval ($\beta=0.315$, $p<.01$) and subjective academic ability ($\beta=0.172$, $p<.01$) had facilitating effects on joy of learning. In addition, motivation to learn ($\beta=0.156$, $p<.05$) and social skills ($\beta=0.142$, $p<.05$) had facilitating effects on joy of learning.

Table 3 A multiple regression analysis on joy of learning for second and third graders

variables	β
class(small/large)	.025
economic level	.137
grade	-.062
boy/girl	.006
social skill	-.033
motivation	.097
subjective academic ability	.333 **
objective academic achievement	.005
classroom atmosphere and approval	.279 **
R^2	.305 **
	** $p < .01$, * $p < .05$, + $p < .10$

Table 4 A multiple regression analysis on joy learning for fifth and sixth graders

variables	β
class (small/large)	.040
economic level	.173
grade	-.016
boy/girl	.074
social skill	-.142*
motivation	.156*
subjective academic ability	.172 **
objective academic achievement	-.025
classroom atmosphere and approval	.315 **
R^2	.379 **
	** $p < .01$, * $p < .05$, + $p < .10$

DISCUSSION

First, we will discuss the effect that classroom atmosphere and approval had on facilitating the joy of learning in all grade levels.

The following were some of the students' narratives of the moments of joy in learning by open-ended question:

- "I was playing a bamboo horse, and my teacher praised me for doing well on it." (2nd grade)
- "When I was learning, I was listening to the teacher carefully. I was complimented on my good posture in listening. I was happy." (3rd grade)
- "The teacher praised me for my handwriting during the calligraphy class." (4th grade)

It is apparent that teachers do not overlook the good but little things such as posture and neatness of handwriting and praise them. We guess that being recognized by teachers even for such small things will contribute to children's enjoyment of learning.

In addition, in the upper grades there were the following narratives:

- "I was very happy because everyone in class said, 'You did a good job.'" (5th grade)
- "My friends said, 'You are amazing.'" (6th grade)

In the younger grades, many students wrote that they were happy to receive approval from their teachers. As the grades increased, they tended to write more about approval from their friends and fun. It was suggested that being praised or recognized by others, whether it is a teacher or a friend, is important for the joy of learning. In addition, for children, as they advance in development, the most significant others shift from teachers and parents to friends gradually. Therefore, in upper grades, it is important for teachers to create an atmosphere in the classroom

where children can find out the small progress and achievements of friends and recognize them each other.

Second, we will discuss the result that for all graders, students with high subjective academic ability found learning fun. Subjective academic ability is the self-perception as a learner, such as “I will be able to understand the lessons in school very well. I’m not poor at learning in school at all.”

According to Shobu et al. (2016), positive psychology points out the importance of children experiencing programs that help them reaffirm their strengths and increase their self-esteem through various school events. Through such programs, children are expected to develop a positive self-perception. The higher the grade, the more complex the content to be learned becomes. In such situations, a positive self-perception will help children to actively engage in learning even when the content becomes more difficult. In addition to that, in order to directly increase students’ subjective academic ability, teachers need to create lessons that are easy to understand.

In addition, in this study, family’s economic level has little effect on students’ interest on studying and learning process. In regards to academic performance, it has been reported that there is basically a link between children from poor families and low academic performance (Yagi, 2018:68). In addition, Yagi (2018:69) and a study commissioned by the Ministry of Education, Culture, Sports, Science and Technology (Ochanomizu University, 2014) have reported that some schools have achieved results that exceed the statistically predicted academic performance based on the socioeconomic background of the children’s families through various efforts and support. In other words, school initiatives and teacher efforts can reduce the impact of poverty on academic performance.

Giving children the experience that learning is fun has the potential to have a greater impact on their lifelong learning than their current academic performance. In other words, it is important for children of all economic levels to experience that learning is fun through the efforts and support of schools and teachers.

In this study, on the scale of 1–4, 1 being the lowest and 4 being the highest, 93.5% of the 693 children in grades two to six levels answered that learning was either 3 (fun) or 4 (very fun). In other words, many children found learning fun regardless of their parents’ economic level. This suggests that the teachers in the schools are making efforts to make classes interesting for children. There were examples of interesting lessons in the children’s narratives:

- “In science, when we raised larvae, they turned into pupae and then into cabbage white butterflies. I was so happy to see so many cabbage white butterflies flying.” (3rd grade)

- “In science, we raised eggs of swallowtail butterflies and cabbage white butterflies. What do they eat? What kind of environment is good for the Swallowtail

butterfly and the Cabbage white butterfly? It was fun and interesting to think about all these things.” (3rd grade)

- “It was fun to measure the size of the gymnasium in the fourth-grade math class by laying out the many square meters of newspaper we had made.” (5th grade)

As mentioned above, in the third grade science class, the children did an experiment on caterpillars. They fed them and everyday they observed the changes. They made hypothesis of what will happen to the caterpillars. They felt the joy of witnessing the process of it becoming butterflies. In the 4th grade math class, the students guessed the size of the gymnasium. And then they measured the area by measuring the length and width of the gymnasium using the unit of meter squared. Moreover, they enjoyed the fun of measuring using a handmade measuring stick. Also they developed the value of cooperation and the fun of working together as a group to reach an answer.

The importance of “sensory experience” in the understanding of arithmetic units and fractions has been argued (Yoshie, 2007:39). In addition, Sugawara (2018b:165) told that it is important to make children feel the connection between arithmetic and their daily lives to arouse their interest. It can be inferred that the teaching strategies on the part of teachers may have an impact on the fact that most children in this study find learning fun, regardless of their parents’ economic level.

In Japan, however, the Courses of Study for Elementary School Education placed foreign language activities in the fifth and sixth grades in 2008, and English education in elementary schools was officially implemented in 2020. In other words, English became a subject from the fifth and sixth grades of elementary school. Classes are being held using official textbooks, and students are graded and evaluated in the report cards.

In junior high school, it is said that one of the reasons behind the poor academic performance is the poverty that prevents students from attending cram school (Tanda, 2019:8). Therefore, in the future, a similar situation may occur in the fifth and sixth grades of elementary school. Children with parents of high economic level are likely to have already been to an English cram school by the time they enter the fifth grade. When English classes begin in the fifth grade, there may already be a gap in performance between children who have been to an English cram school and those who have not. This may cause children who have never known English to feel a lack of confidence and a lack of understanding of the subject. This may also affect their enjoyment of learning. Further study is required on this point.

Third, we will discuss the effects of social skills and motivation. These factors were not seen in the early grades but were seen to influence the joy of learning in grades 5 and 6. In the upper grades, cooperative learning becomes more common in a variety of subjects. Therefore, children with high social skills will be able to actively participate in cooperative learning and find it enjoyable to learn.

In addition, in the middle and upper grades of elementary school, experiments are more common in science. According to the Ministry of Education, Culture, Sports, Science and Technology (2011), the experiments are as follows: Examining the nutrition of kidney bean seeds with iodine solution. Growing green beans in different ways to determine what the plant needs to grow. Using a microscope to observe the pores and other features of plants. Experimenting with the movement of a pendulum. Understanding how to connect a light bulb, a dry cell battery, and a conductor, and how the light turns on. Learning about the power of air and water by making an air pistol and a water pistol. Observing the change in volume of air, water, and metal by heating and cooling them. Learning that carbon dioxide is produced by burning things, etc.

The following were some of the narratives given by children respondents.

- “For the science experiments using batteries, we learned how it works by comparing bean bulb and a light-emitting diode. It was fun. Another science experiment that I did was making and using solar-powered car. I tested it if will run. The result was it ran fast, so it was interesting.” (4th grade)

- “The most interesting part was the science experiment. I was excited to see what the results would be, and it was interesting.” (6th grade)

- “In science, the experiments were interesting, and it was fun to guess the results with my peers.” (5th grade)

- “In science, it was interesting when we did various experiments and got results that were different from our expectations.” (6th grade)

In science subjects, children make things and conduct experiments by themselves. They follow the problem-solving process, such as asking questions to themselves, thinking, planning, implementing, and verifying. In addition, as many of the experiments are done by small group, after they hypothesize the results by themselves, they share their hypothesis and their experience with peers in the group through discussion. After that, they validate their hypothesis and deepen their conclusion. In the process, students are required to validate their guesses if they were true or not. It was suggested that these heightened motivations led to enjoyment of learning.

Another student wrote,

- “When we did a science experiment, the conditions were met, but we failed. So, I became more curious and asked, ‘Why?’” (5th grade)

Failure made things more interesting for them. They were further motivated to clarify their questions. Since the failure in a group experiment is not the failure of only one person. It did not directly lead to the immediate loss of self-confidence. Then, it led to the desire to reconsider the reasons why the experiment failed. Therefore, they enjoyed trial and error experience.

In addition to the above, in Japan, other activity to motivate children is also conducted. In the upper grades in many elementary schools, parents are invited to present their professions to the class. The purpose of this activity is to stimulate the

children's interest in various professions and to make them realize that they need to study to achieve what they want to be. If the students clarify their future goals in this kind of class, their motivation to learn will increase. They will be actively trying to learn and may lead to the joy of learning. The following was written by a child.

- "My dream is to become a first-class architect. That's why I try harder in arts and crafts than in other subjects because it will help me in the future, and I enjoy it." (6th grade)

Incidentally, on the question of fun of learning on a 4-point scale, the respective mean scores of each grade were as follows: 3.634 for 2nd grade, 3.581 for 3rd grade, 3.461 for 4th grade, 3.401 for 5th grade, and 3.325 for 6th grade (See Table 1). It showed that 2nd graders gave the highest mean score, while the 6th graders gave the lowest mean score. Statistically, both two-factor analysis of variance and multiple regression analysis showed significant differences between the grades. This means that as the children go to the higher level of schooling, their sense of enjoyment in learning decreases.

In Japan, there is a phenomenon known as the "10-year-old barrier" (Watanabe, 2011:39). It means that individual differences in academic achievement widen in the middle grades of elementary school. Some children show stagnation academically. This may influence the decrease in the enjoyment of learning in the fifth and sixth grades.

On the other hand, Watanabe (2011:117) says that this period after the age of 10 is also important time when the ability to think deeply develops and meta-cognition undergoes a qualitative change. In other words, this is a time when they have a lot of potential to learn. Therefore, teachers need to be creative in their teaching methods so as not to diminish the children's joy of learning after the age of 10.

In this study, we found that there are some children who felt learning fun even in the upper grades. Therefore, in Study 2, we will focus on the children who find learning enjoyable even in the upper grades. We will investigate the situations in which they find learning enjoyable. By finding out, we would like to get some suggestions on how teachers should be involved in class.

STUDY 2

In Study 2, we will analyze the narratives of children who feel that learning is fun even in the upper grades. Then, we will examine the factors that make upper graders feel the joy of learning.

METHODS

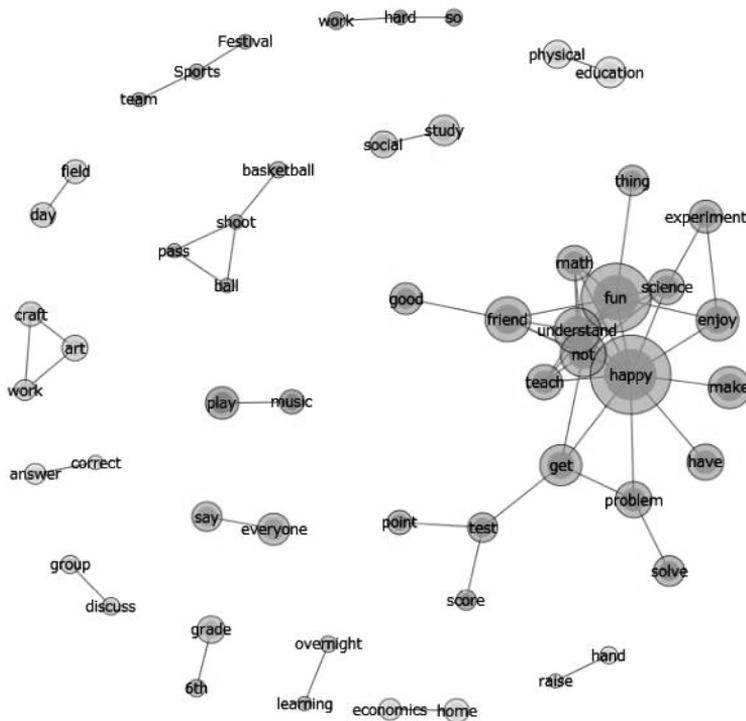
We focused on 6th graders because they were the lowest in joy of learning scores. Next, we extracted 6th graders who answered 4, that is, they feel learning

“very fun”, on a scale of 1 to 4 for enjoyment of learning. The number of children with the rating of 4 was 68 (44%) out of 154 total 6th graders.

Then, the narratives of 68 sixth-grade students (35 boys and 33 girls) were analyzed. The total number of sentences written by the students was 502. As qualitative analysis, we decided to use the KH coder, which has been highly evaluated in recent years because it has excellent data extraction functions and can easily extract various information from text (Sano & Lee, 2007: 94). Therefore, we used four methods of the KH coder.

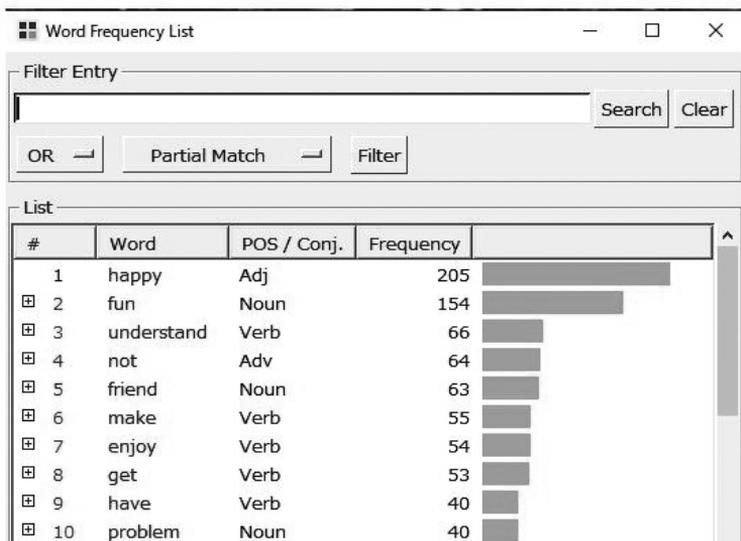
RESULTS

1) First, we used the KH coder’s co-occurrence network diagram to draw an overview of the overall relationships between the words in the children’s sentences (see Figure 2).



As shown in Figure 2, the words that were connected to the words happy, fun, and enjoy were the words understand, able, friend, teach math, problem, solve, science, and experiment. From this figure, it can be inferred that these words are the most related to the enjoyment of learning.

2) Next, we examined the most frequent words in all 502 sentences by using the KH coder's Word Frequency List. The result was shown in Figure 3.



The most frequently occurring words in the children's sentences were, in descending order, "happy" 205, "fun" 154, "understand" 66, "not" 64, and "friend" 63. These sentences were written by children who answered 4 on a 4-point scale when asked if they enjoyed studying. Therefore, it is natural that the words "happy" and "fun" appear most frequently in these sentences. The next most frequent word was "understand".

The results of 1) and 2) suggest that the word "understand" is associated with the joy of learning.

Children might find it interesting to learn when they "understand" something.

3) Next, we focused on the Jaccard coefficient. It measures the strength of co-occurrence between words in the co-occurrence network diagram. The closer the Jaccard coefficient is to 1, the stronger the association: 0.2 is a strong association; 0.3 is a very strong association.

We examined the words that are highly co-occurring with the word "understand".

According to the Jaccard coefficient of the KH coder, the words strongly related to the word "understand" were as follows in this order: the Jaccard coefficient for "not" was 0.68, followed by 0.310 for "teach", 0.253 for "math", and 0.253 for "problem" (See Table 5).

N	word	POS	Jaccard
1	not	Adv	0.368
2	teach	Verb	0.310
3	math	Noun	0.253
4	problem	Noun	0.253
5	happy	Adv	0.130
6	solve	Verb	0.123
7	what	W	0.121
8	have	Verb	0.116
9	friend	Noun	0.114
10	something	Noun	0.096

As shown in Table 5, the two words with a Jaccard coefficient of more than 0.3 and were very strong association with “understand” were “not” and “teach”.

With “not” and “understand“, it was inferred that there is a situation in which the children do not understand something. In addition, it was inferred that they felt the joy of learning in a situation where “teach” and “understand” were connected. Therefore, we examined how children feel the joy of learning when “teach” was expressed in the actual sentences.

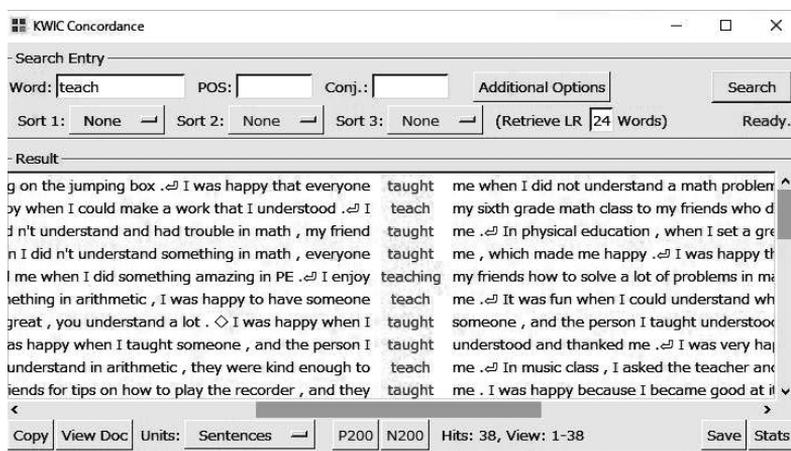


Figure 4 showed some examples of 38 sentences including “teach”. These sentences were extracted by the KWIC concordance.

The content of sentences included expressions such as “I’m happy that my teacher taught me and I understand,” “I’m happy that my friend taught me and I understand,” and “I’m happy that I taught my friend.” Therefore, the sentences were then categorized according to who was teaching whom, and which subject was being taught.

<i>Table 6 Content of sentences including "teach"</i>		
who to whom	N	subject
Happy to be taught by teachers	4	math 3, others 1
Happy to be taught by friends	19	math 16, others 3
Happy to teach friends	15	math 10, others 5
total	38	math 29, others 9

The result was in Table 6. In terms of who teaches, 4/38 were teachers and 34/38 were friends. The results showed that more students described the joy of being taught by a friend than by a teacher. In the case of friends, 15/38 described the joy of teaching and 19/38 the joy of being taught. As for the subjects, 29/38 were math, and 9/38 were other or unknown.

DISCUSSIONS

In Study 2, we analyzed the sentences of the 6th graders which situation they found enjoyable in learning. In their sentences, the most often used word was “understand”. The words that co-occurred highly with “understand” were “teach,” “math,” and “problem” in the Jaccard coefficient. Furthermore, in 29 of the 38 responses (76.31%), the children wrote about the joy of learning in mathematics. From these, it can be inferred that the joy of learning was often felt in math classes.

In Japan, there is a growing concern that students in the upper grades of elementary school and beyond are losing interest in math and science (Yoshie, 2007:37; Inoue & Hashimoto, 2018:3). The interviews with elementary school teachers in Inoue & Hashimoto (2018:7) pointed out the existence of elementary school students who actually got stuck in math at school. Nowadays, there is a trend of decreasing interest on mathematics among the upper grade level students. Therefore, it was interesting to note that the sixth graders in study 2 stated that they enjoy learning mathematics.

The results also showed that of the 38 sentences written by the students, 4 were about the teacher’s method of teaching mathematics and 34 wrote about peer teaching. From this, it can be inferred that the situation in which students enjoy understanding mathematics is more likely to be an interaction between students than an interaction with the teacher in the 6th grade. Kaaufman et al. (2015:171) pointed

out the importance of teacher-student interaction for fifth-grade students to engage positively in math. They found out that teachers' warm, caring, and individualized approaches to students influenced their engagement in math (Kaufman et al., 2015:181). Math is considered a difficult subject in the upper grades. Therefore, the way teachers interact with students is important.

Furthermore, in Japan, the focus is on student-to-student interaction more than teacher-student interaction. The new Courses of Study (Ministry of Education, Culture, Sports, Science and Technology, 2016:23) pointed out the importance of students solving problems proactively and cooperatively in all subjects, including mathematics. Tsuneda (2018:21) stated that in mathematics, it is not just important to answer correctly. He argued that the process of thinking together and trial and error should be emphasized. Some practices of children's interactive learning in mathematics classes started in the early grades in Japan (Yamada, 2017a:40-46; Yamada, 2017b: 162-168) and have been conducted in all grades (Makino, 2020:480-482). In addition, Suzuki (2019:53) discussed the process of group learning in fifth-grade math. Watarai (2019:79-83) also reported learning in math with peers through dialogue for fifth-grade students. In view of the above, interactive learning in mathematics, which can be started in the early grades, and there are more reports of practice in the upper grades.

In addition, in Japanese schools, there are many small-group cooperative learning activities in other subjects than math, such as experiments in science and cooking at home economic. According to Yoshitake et al. (2015), the percentages of children who wrote that they felt joy in cooperative learning were as follows: 4% in grade 2, 1% in grade 3, 6% in grade 4, 9% in grade 5, and 16% in grade 6. This suggested that children in the upper grades found cooperative learning more enjoyable. In view of the above, children's many experiences of cooperative learning and thinking in various subjects, may have led to their enjoyment of peer teaching and learning in difficult subjects like mathematics.

In addition, in recent years, meta-cognition has often been discussed in the field of educational psychology as something that facilitates learning. Meta-cognition is said to be "cognition of cognition." It is also the ability to think about what one knows and what one does not know (Watanabe, 2011:117). A qualitative change in meta-cognition is said to occur in the middle to upper grades of elementary school. In other words, upper graders are able to perform meta-cognition not only from their own perspective but also from the perspective of others (Watanabe, 2011:118). Therefore, in the upper grades, children who are teaching their friends may enjoy the process of thinking from the other person's point of view while using meta-cognition. They may find it interesting to deepen their thinking from the other person's point of view, wondering where they are getting stuck and how they can help the other person understand. The following were sentences from students who found peer teaching interesting.

- “It’s fun to think of explanations to give to my friends so that they can understand. I am very happy when I hear my friends say, ‘I got it!’”
- “In math, it is interesting to think about what kind of hints I can give to friends to help them understand.”

On the other hand, according to the results of Study 2, there were 19 cases in which the children enjoyed being taught by their friends. It can be inferred that they did not feel inferior. It is suggested that they did not focus on the horizontal comparison of superiority and inferiority between themselves and their friends. It is suggested that they were able to feel the joy of learning in the vertical comparison within themselves, that is, they are now able to understand what they did not understand before. The following were samples of sentences expressed by some student who were happy in peer teaching and learning:

- “I was happy to have a friend teach me math. Because when a friend teaches me a problem that I have been struggling with and I can understand it, I feel refreshed.”
- “My friend taught me how to do mathematics, and I understood it, and I was happy.”

The joy of sixth graders focusing on the growth within themselves was described in other subjects as well, as in the following sentences:

- “At first, it was impossible for me to swim 25 meters, but I got better and better, and when I could swim 25 meters, I was happy and thought it was interesting.”
- “I was happy because in the 20 m shuttle run, I ran 80 times, nine times more than last year’s record.”

Being able to swim 25 meters or do 80 times of shuttle run is a good record, but it is not a great record compared to others in 6th grade. However, they felt happy to note the growth within themselves that they have improved more than before.

In developmental psychology, in the upper grades, the most significant others for children are friends. This is also the time when the gap in academic achievement widens. Therefore, children are likely to be concerned about how they are doing compared to their friends, and how they are evaluated by their friends. However, based on the results of this study, it was suggested that in their classes a classroom atmosphere has been formed in which children can feel as follows: They can learn from their friends, and their friends won’t evaluate them negatively by it. In addition, they don’t need to compare themselves to their classmates. They know that growth within themselves is valuable. Tsuneta (2018:19) stated that classroom development is important for independent, interactive and intensive group learning to take place. In addition, in study 1 of this research, the classroom approving atmosphere was one of the major factors in determining the enjoyment of learning.

In Japanese schools, learning is not only conducted through the collaboration of children, but also through competition. However, most of the time, competition is not between individuals, but between groups. Inter-group competition encompass-

es intra-group cooperation. Group competitions are held in various subjects such as relay races or team gymnastics in physical education and debate in Japanese. In addition, it is also done in school events such as inter-class chorus music concerts and fields days for all grades. The followings were examples of narratives by the sixth graders.

- “I was happy when we played a song together in music and it matched perfectly. It made me feel that we can do it.”

- “In the class competition relay, we passed the baton from one to another, and I was happy that our team was able to finish in second place.”

- “I was very happy when our team won the Sports Day.”

It is thought that this creates a strong sense of fellowship, of “we” rather than “I”.

This may help to create an atmosphere in the classroom that encourages students to share and think together about their peers’ difficulties. This may lead to children who are good at mathematics, not feeling bored when a problem they already know, but to try to think about the problem from the perspective of the children who do not know the problem. They develop the value of teamwork and cooperation.

BASED ON THE ABOVE, WE CONCLUDE AS FOLLOWS

In a classroom there are children of varied levels of development and abilities. In addition, as the grades increase, the academic achievement gap widens. Number of children who do not understand increases, especially in difficult subjects. In those ages, the significant others are friends. Therefore, it is necessary to create a class atmosphere where children feel safe to disclose their lack of understanding in front of their friends. In addition, it is also necessary to create a classroom atmosphere where everyone is actively able to engage in the tasks at hand and feel the joy of learning through free dialogue and cooperation. In creating this kind of classroom atmosphere, teachers need to examine how they do classroom management and how they introduce group competition and cooperation into their lessons.

In addition, what kind of cooperative learning among students will be required in this kind of classroom atmosphere? Interactive cooperative learning is also encouraged in subjects that do not have correct answers, such as morality (Masui, 2018: 1). Furthermore, in cooperative learning, teachers tend to have a role to summarize at the end (Tsuneda, 2018: 20). However, Ishikawa (2017:129) argued that it is important for children to keep thinking and searching for answers on their own, sometimes even after the class is over. He pointed out that in developing each child to be an active learner, the teacher should not be a teaching leader. He stated that the teacher’s role is to be able to propose questions that make students want to think actively, and to be able to propose questions that do not have correct answers to the students in the class. We think that cooperative learning requires not only that students actively help each other, but also that each child, especially when faced with

a problem for which there is no answer or for which it is difficult to find the right answer, should be able to use critical thinking to find a better answer together, while stimulating each other in a relaxed classroom atmosphere. Teachers are required to create a classroom atmosphere that enables this to occur.

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