AN INVESTIGATION INTO PARENTS' CONCERNS ABOUT PROGRAMMING EDUCATION IN JAPANESE PRIMARY SCHOOLS

Yukiko Maruyama
Tokai University, Hiratsuka Kanagawa, Japan

ABSTRACT

To investigate the effects that experiences of programming have on parents' concerns about programming education in primary schools, a survey was carried out before and after a programming seminar for children and their parents. Participation in the programming seminar seemed to boost parents' expectations and decrease their anxieties about introducing programming education to primary schools. Findings also suggest that parents' attitudes and confidence in involvement in supplementary instruction at home improved. Since the survey is ongoing, the number of participants in this study was limited. It is necessary to carry out a statistical analysis with more participants.

KEYWORDS

Programming Education, Primary School, Parents' Concerns, Computing Thinking, Logical Thinking, Problem-Solving

1. INTRODUCTION

There have been widespread attempts to introduce computational thinking to primary/secondary or K-12 education (Barr 2011, Grover 2013). The term "computational thinking" was first used by Papert (1993), and popularized by Wing (2006). According to Wing, " 'Computational thinking' involves solving problems, designing systems, and understanding human behavior, by drawing on concepts that are fundamental to computer science." (p. 33). Additionally, she stated that computational thinking is a fundamental skill for everyone and that it should be added to every child's analytical ability. The article drew the attention of many education researchers and educators, and many researches related to computational thinking in K-12 have since been carried out. In the United Kingdom, a new subject, "computing," was introduced to primary and secondary schools. In the primary teachers' guide for the subject "computing," the importance of computational thinking is repeatedly stated.

As computational thinking increasingly draws attention, programming education is also receiving attention as one of the ways of teaching computational thinking. Lye and Koh (2014) state that "programming is more than just coding, for it exposes students to computational thinking which involves problem-solving using computer science concepts, and is useful in their daily lives" (p.51). In Japan, the central council for education in the Ministry of Education, Culture, Sports, Science, and Technology submitted a report that mentioned the introduction of programming education to primary schools. Another council report said that programming education in primary schools should not aim to merely teach students coding, but rather to foster students' programming thinking. Programming thinking is considered to be a similar concept to computational thinking and a part of computational thinking. However, the misconception that the aim of programming education is to learn coding has begun to spread among parents. The parents' role in primary education is very important, and their attitudes toward education have considerable influence on children's attitudes. Indeed, some researchers have investigated parent-child collaboration in learning programming (Lin and Liu 2012, Hart 2010). Parents' misconceptions and anxieties related to programming education could become obstacles to their involvement in children's learning. To smoothly and appropriately introduce computer education to primary schools, it is important to know parents' concerns about programming education. Moreover, it is necessary to encourage parents' involvement in programming education.

ISBN: 978-989-8533-81-4 © 2018

This study aims to establish a support system for parents to get them involved in programming education in primary schools. This paper provides the results of a preliminary investigation into the influence of participation in a programming seminar for children and parents on changes in parents' concerns about programming education in Japanese primary schools.

2. INVESTIGATION

The survey for this study was conducted in August 2018. Participation in the survey took place at programming seminars for children and their parents, which were organized by the author. Three kinds of programming seminars were held. One was for first and second grade primary school students and their parents, and wooden robots were used as teaching materials. Another one was for third to sixth grade students and their parents, and toy robots were used. The last one was for first to sixth grade students and their parents, and visual programming language was used. Participants were recruited via brochures distributed through seven local public primary schools in Kanagawa which is nearby Tokyo. Participants required to attend to seminars as a group of students and their parents or guardians. Sixty-three groups of students and parents took part in the seminars. Two of them include two students, and one group include both parents.

Participants in seminars were handed two questionnaires at the reception of programming seminars and were asked to fill them before and after the seminar respectively; this was voluntary. Fifty-four valid responses were obtained. Of the 54 participants in the survey, 40 were mothers, 13 were fathers, and one was a grandfather of primary school children. The average age of participants was 42.0. The ages of participants and school years of their children are shown in Tables 1 and 2, respectively.

Table 1. Ages of participants

Age	Frequency
-39	15
40-44	23
45-49	8
50-54	3
55-	1

four were non-responses

Table 2. School years of participants' children

School year	Frequency
1	7
2	7
3	7
4	15
5	10
6	9

Questionnaires included the following sections, 1) demographics of participants and their children (for pre-questionnaire), 2) participants' perceptions of programming, 3) attitudes toward programming education in primary schools, 4) expectations of introducing programming education to primary schools, 5) anxieties regarding the introduction of programming education, and 6) participants' experiences of computer usage (for pre-questionnaire). There were other questions that sought responses from children, but the results of these questions have not been included in this paper. Table 3 shows items in part 3, 4 and 5.

With regard to part 5, two researches related to English education in primary school(Morita 2011, Makino 2008) were referred for making the items. The reasons for referring is as follows.

1)There are few research related to programming education in primary school focusing on parents' concerns.

2)English education will be introduced into primary school as a subject in Japan from 2020. Compared with programming education, English education in primary school appears to get more attention from researchers. Therefor there are many insightful researches. It is apparent that useful suggestions for researches on programming education can be gained from those researches.

The aim of study by Morita (2011) was to establish the learning environment at home for English education. They stated that it is necessity to know parents' concerns regarding English education to establish the environment. Therefor they considered studiously items for questionnaire for investigating parents' concerns and decided to include items about parents' anxieties regarding English education.

Makino (2008) carried out a survey on parents' concerns on English education in primary school. The results of the survey showed that parents were anxious about contents and policies of education and teachers.

3. RESULTS

The survey is still ongoing and the number of responses at this stage is not enough for a statistical analysis. This paper provides a summary of the changes in parents' attitudes, expectations, and anxieties regarding programming education, and discusses their attitudes toward supplementary instruction at home before and after the seminars.

With regard to attitudes toward programming education in primary schools, participants were asked to choose a response from a five-point Likert scale ranging from 1- I completely agree to 5 - I completely disagree for six items in Table 3. Figure 1 shows changes in the average values of each item for all participants' responses before and after the seminars. A low value means positive attitudes for items 1, 2, 3, and 5, and negative attitudes for items 4 and 6. Although parents' attitudes changed and became positive, a tendency for participants to agree with the statement "Elementary school is too early to learn programming" was identified.

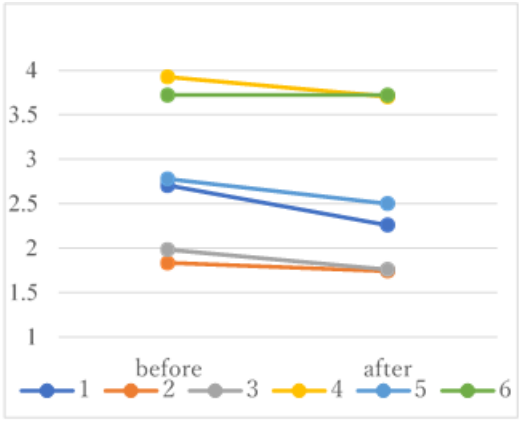

Figure 1. The mean value of responses to questions concerning parents' attitudes

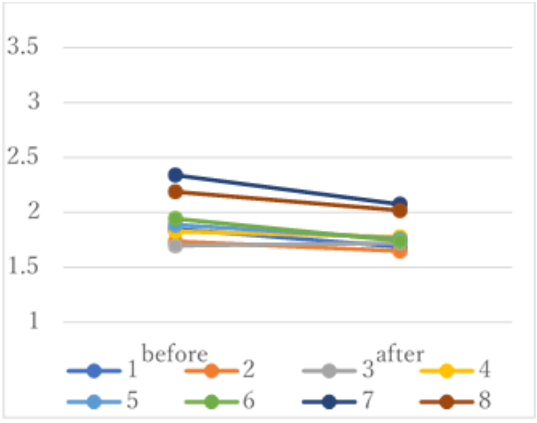

Figure 2. The mean value of responses to questions concerning parents' expectations (1-8)

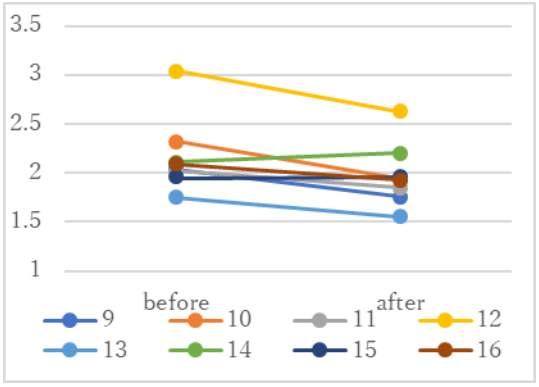

Figure 3. The mean value of responses to questions concerning parents' expectations (9-16)

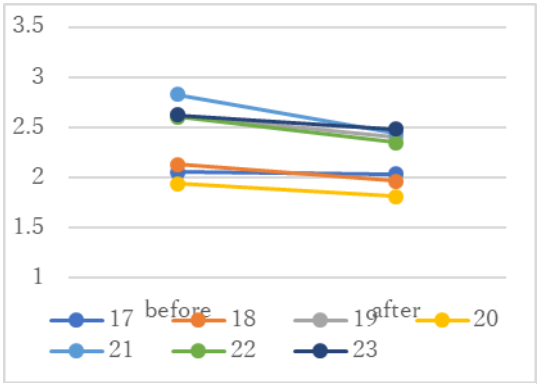

Figure 4. The mean value of responses to questions concerning parents' expectations (17-23)

With regard to expectations for introducing programming education, participants were asked to respond according to a five-point Likert scale ranging from 1 - I fully expect it, to 5 - I do not expect it at all, for 23 items in Table 3. Figures 2, 3, and 4 show changes in the average values of each item for all participants' responses before and after the seminars. A low value indicates high expectation. Overall, parents' expectations seemed to rise, especially for the statements, "Children will learn to be creative," "Children will learn how to express themselves," and "Children will be better able to communicate."

With regard to anxieties regarding the introduction of programming education, participants were asked to choose a response from a five-point Likert scale ranging from 1- I am very anxious to 5 - I am not anxious at all, for 10 items in Table 3. Figure 5 shows changes in the average values of each item for all participants' responses before and after the seminars. Only for the statement "There are not enough teachers to provide instruction" did parents' anxiety increase.

Overall, it seems that patents' attitudes toward programming education became positive, the expectations for introducing programming education increased, and anxieties decreased.

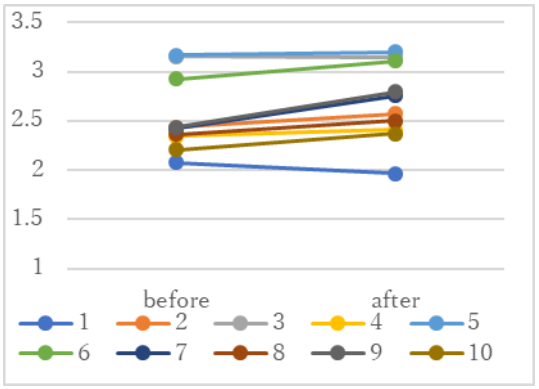

Figure 5. The mean value of responses to questions concerning parents' anxieties

With regard to attitudes toward supplementary lessons at home, participants were asked to answer three questions; 1.) Do you think supplementary instruction outside of school will be necessary for programming education? 2.) Do you think you will be involved in supplementary instruction for programming education at home? and 3.) If you will be involved in supplementary instruction at home, how much confidence do you have in your involvement? Figures 6 to 8 show the result. Before the seminars, more than half of the participants replied with "Do not think really so" or "Do not think so at all" to question 1. However, about 70% of the participants replied with "Very much think so" or "Think so somewhat" after the seminars. Concerning the necessity for supplementary instruction, participants' awareness seems to have increased. Concerning question 2, the number of participants who answered "Will not be very involved" decreased from 11% to 2%. On the contrary, the number of participants who answered "Will be actively involved to a certain extent" increased from 17% to 30%. Concerning question 3, the number of participants who answered "I'm not confident at all" decreased from 32% to 9%. On the contrary, the number of participants who answered, "I'm somewhat confident" increased from 23% to 35%. It seemed that the attitude and confidence in involvement in supplementary instruction at home also improved.

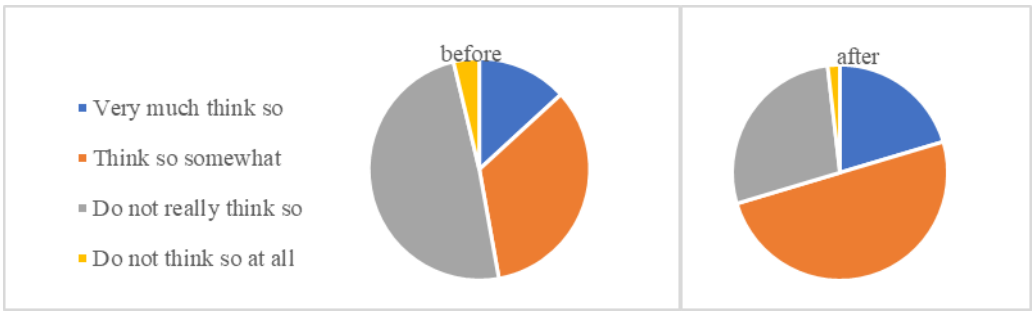

Figure 6. Views on necessity of supplementary instruction

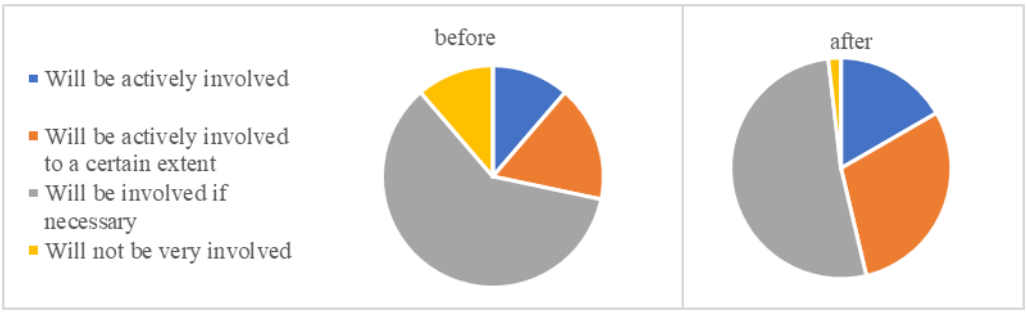

Figure 7. Involvement in supplementary instruction

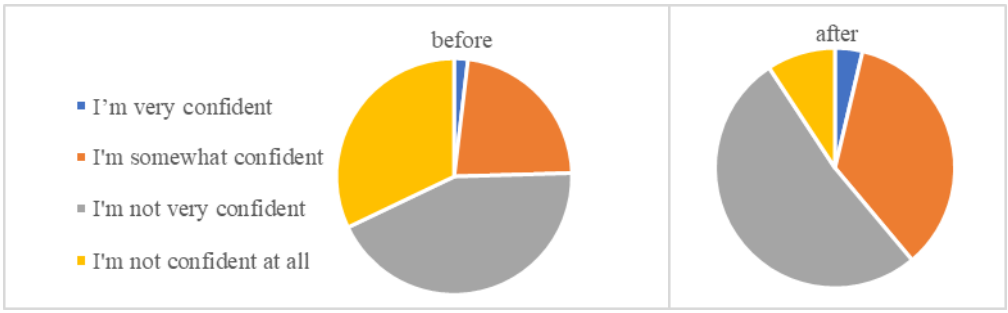

Figure 8. Confidence in involvement in supplementary instruction

4. CONCLUSION AND FUTURE WORK

It seemed that participation in programming seminar boosts parents' expectations and decreases anxieties about introducing programming education to primary schools. It also suggests that parents' attitudes and confidence in involvement in supplementary instruction at home improved. Since the survey is ongoing, the number of participants was limited. It is necessary to carry out statistical analysis with more participants. A brief acknowledgement section may be included here.

REFERENCES

Barr, V., and Stephenson, C., 2011. Bringing computational thinking to K-12: What is involved and what is the role of the computer science education community? *Acm Inroads*, Vol. 2, No. 1, pp. 48-54.

Grover, S., and Pea, R., 2013. Computational thinking in K–12: A review of the state of the field. *Educational Researcher*, Vol. 42, No. 1, pp. 38-43.

Hart, M. L., Making contact with the forgotten K-12 influence: Are you smarter than YOUR 5th grader? *Proceedings of the 41st ACM technical symposium on Computer science education*, Wisconsin, USA, pp. 254-258.

Lin, J. M.-C., and Liu, S.-F., 2012. An investigation into parent-child collaboration in learning computer programming. *Educational Technology & Society*, Vol.15, No.1, pp162–173.

Lye, S. Y., and Koh, J. H. L., 2014, Review on teaching and learning of computational thinking through programming: What is next for K-12? *Computers in Human Behavior*, Vol. 41, pp. 51-61.

Makino, M., 2008. Parental perception of English activities at elementary schools – focusing on expectation and involvement-, *Research Institute for Communication, Kansai University of International Studies, Studies on Communication*, 6, 61-73 (in Japanese).

Morita, A., 2011. Data analysis of parents' involvement in primary school English language education, *Waseda review of Education*, 25, 1, 163 – 172 (in Japanese).

Papert, S. 1993. *Mindstorms: Children, Computers, and Powerful Ideas*, 2nd ed, Basic Books, New York.

Wing, J.M. 2006. Computational Thinking, *Communications of the ACM*, Vol. 49, No. 3, pp. 33-35.

Table 3. Questions concerning parents' attitudes, expectations and anxieties about introducing programming education

Attitudes (How do you feel about programming being taught in school?)
(1) Everyone needs to know how to program.
(2) Programming should be taught from elementary school.
(3) Programming will be required in future societies, so it should be taught in elementary school.
(4) Elementary school is too early to learn programming.
(5) Programming should be part of the elementary school curriculum.
(6) Programming will affect students' other studies, so it should not be taught in elementary school.
Expectations (Do you expect the following outcomes as a result of introducing programming education?)
(1) Children will become skilled at using computers
(2) Children will like using computers
(3) Children will learn to think logically
(4) It will help with work in the future
(5) Children will learn how to use information and communications technology (ICT)
(6) Children will learn ICT skills
(7) It will foster personnel with advanced ICT skills
(8) Children will learn problem-solving skills
(9) Children will learn to be creative
(10) Children will learn how to express themselves
(11) Children will acquire problem-identification skills
(12) Children will be better able to communicate
(13) Children will be inclined to use computers
(14) Children will be able to use a computer to write compositions
(15) Children will be able to use a computer to draw pictures
(16) Children will understand how a computer works.
(17) Children will be able to write computer programs.
(18) Children will learn how to use the internet.
(19) Children will understand arithmetic and science.
(20) Children will think about the steps one must follow when performing a task.
(21) Children will be better able to study other subjects.
(22) Children will be better able to communicate their thoughts.
(23) Children will be better able to work with others.
Anxieties (Are you anxious about the following items concerning programming education in primary schools?)
(1) There are not enough teachers to provide instruction
(2) The aim of programming education is not clear
(3) Perhaps programming will adversely affect the study of other subjects
(4) The content taught differs depending on the school and teacher
(5) The burden on children will increase
(6) I wonder whether my child can keep up
(7) I wonder whether I can provide guidance at home?
(8) Perhaps there are inequalities in the degrees of comprehension
(9) Contents of programming education are not clear
(10) I wonder whether the teacher can take care of the whole class.