PARENTAL INVOLVEMENT AT THE BEGINNING OF PROGRAMMING EDUCATION

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ABSTRACT

The increased focus on computational thinking has led to the acceptance of computer programming as one of the ways of teaching computational thinking. In 2020, Japan introduced programming education in elementary schools. To understand the current situation of parental involvement at the beginning of programming education, this study aimed to know parents' experience in being involved with programming education and their beliefs that motivated them. Parents with children in elementary school were requested to complete a survey with regard to experience in behaviors related to programming education. The outcome showed parent involvement is minimum in programming learning.

KEYWORDS

Computer Programming, Elementary School, Parental Involvement, Parents' Beliefs

1. INTRODUCTION

There have been widespread attempts to introduce computational thinking in elementary and secondary or K-12 education (Barr and Stephenson 2011; Grover and Pea 2013). The term "computational thinking" was first coined 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). She also stated that computational thinking is a fundamental skill for all and every child should have this analytical ability. The study garnered the attention of many education researchers and educators and led to substantial research studies related to computational thinking in K-12.

As computational thinking increasingly draws attention, computer programming is also being accepted as one of the ways to teach 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). Relkin et al. (2021) carried out a longitudinal study to examine the changes in computational thinking skills in first- and second-grade students exposed to a developmentally appropriate coding curriculum. The study provided empirical evidence that their curriculum could accelerate the acquisition of computational skills. Moreover, as Zhang and Nouri (2019) reviewed, many studies were conducted that included the visual programming language Scratch in learning computational thinking.

In 2020, Japan introduced programming education in elementary schools. The Central Council for Education in the Ministry of Education, Culture, Sports, Science, and Technology (MEXT) noted that the aim of programming education in elementary schools should not be to teach students how to code but rather to foster the "programming thinking" of students (translated by the author). Programming thinking is a concept similar to and a part of computational thinking. Thus, coding itself is not the aim of programming education in Japan but is considered as a way to achieve the goal of programming education.

As programming education is gaining importance in formal education, children have more opportunities for gaining programming experience informally. According to a report published by the Ministry of Internal Affairs and Communication, there has been an increase in the number of organizations starting programming classes and lectures in Japan since 2013. Gerson et al. (2022) state that graphical and tangible coding systems have led to positive leaning outcomes in studies with school-aged children. Moreover, these coding systems enable a family to experience programming. Parents play an important role in elementary education, and their

attitude towards education has a considerable influence on those of their children. In the field of education related to new technologies such as programming and robotics, a few studies have shown the positive impact of parent-child collaboration in the workshops on children's attitudes and outcomes (Lin and Liu 2012; Cuellar et al. 2013). However, Maruyama (2018KES), in a survey carried out for parents of elementary school children before programming education was introduced in elementary schools in Japan, found that 77% parents responded that they have very less or no confidence for being involved in supplementary instruction at home. Differences in parental involvement, especially in the early stages of programming education, can make a significant impact on a child's future learning. Parents need to be encouraged to become involved in their child's programming education. Therefore, it is necessary to know the current situation of parental involvement at the beginning of programming education. This study aimed to know parents' experience in being involved with programming education and their beliefs that motivated them.

2. METHODS

A quantitative online survey was conducted in October 2021, the year after programming education was introduced in elementary school in Japan. The respondents were the members of an online market research panel of approximately 13 million members. A screening survey narrowed down the target group to those aged 25–59 years with elementary school children. The request to participate in the survey was sent to the members by the online market research company until sufficient responses were received. After collecting the responses, responses with similar answers to all the questions were eliminated. A total of 2987 valid responses were obtained. The demographic data are shown in Tables 1 and 2.

Table 1. Sex of participants

Sex	Frequency
Male	1287
Female	1700

Table 2. Age of participants

Age	Frequency
25–29	117
30–39	1189
40–49	1360
50–59	321
	Average age 40.9

In examining parents' experiences, five items (Table 3) were designed based on Simpkins et al. (2012), who investigated the association between mothers' beliefs and their children's achievement-related behavior. They referred to the Eccles' socialization model (Eccles 1993) and enumerated mothers' behaviors that influenced children's motivational beliefs: a) role modeling, b) encouragement and reinforcement, c) provision of activity-related experiences (e.g., activity-related materials), and d) parent–child activities. This study examines the extent to which parents experienced behaviors in these four domains.

Table 3. Instruments for parents' behaviors

Parental behavior
Please answer the following questions about your child's and your programming experience out of school.
1. Have you participated in a programming class (short-term) outside of school?
2. Have you had programming experiences at home?
Please answer the following questions about how you are doing at home in regard to learning programming.
3. Have you talked with your child about programming learning and education in school at home?
4. Have you bought a book related to programming?
5. Have you bought a learning material related to programming?

Items 1 and 2, which are about experiences related to programming in a class outside of school and at home, were used to measure the extent to which parents experienced behaviors related to role modeling and parent-child activity. Respondents were asked to choose one of the four options, "Parents have experienced with child," "Only child has experienced," "Only parents have experienced," and "Neither has experienced" for these items. "Parents have experienced with child" was considered as a behavior related to parent-child activity. "Only parents have experienced" was considered as a behavior relate to role modeling. As for encouragement, it seems that parents' verbal encouragement influenced their children's beliefs; therefore,

item 3 was considered a behavior related to encouragement. Provision of activity-related experiences was measured by whether parents bought programming related materials; therefore, items 4 and 5 were considered as behaviors related to the provision of activity-related experiences.

Seven items (Table 4) were designed with respect to parents' beliefs and based on the expectancy-value theory (EVT; Wigfield & Eccles 2000; Wigfield & Gladstone, 2019). The EVT has been applied in several studies related to students' interest and achievement in various subjects, as well as in several studies on parental motivation for involvement in children's learning (Zucker et al. 2021, Simpkins et al. 2012, Šimunović and Babarović 2020).

Three items were related to how parents value programming and had 4-point rating scales. Three were related to parents' expectations for children in programming and had 5-point rating scales. One was related to parent's self-efficacy in supporting children and had 4-point rating scales. Responses were analyzed with the Mann-Whitney test to verify whether there were differences between groups divided by experience or lack thereof of the behaviors as mentioned above.

Table 4. Instruments for parents' beliefs

Parents' value
6. Do you think learning programming will help your child in the future?
7. Do you think learning programming will help your child in everyday life?
8. Do you think learning programming will help your child in learning more than just programming in school?
Parents' expectations for child
9. Do you think your child is interested in programming?
10. Do you think your child likes programming?
11. Do you think your child is good at programming?
Parents' self-efficacy
12. If you were involved in supplemental training at home, how confident would you be?

3. RESULTS AND DISCUSSION

Table 5 shows the results for items about parental behaviors. For role modeling and parent-child activity, respondents were considered experienced if they indicated that they learnt programming in a class outside school or at home. For provision of activity-related experiences, respondents were considered experienced if they indicated that they have bought a book or a learning material. The result shows that parents do not involve in programming learning so much. 70.6% of respondents indicated that they had little or no confidence of getting involved in supplementary instruction at home (Item 12). It is possible that the lack of confidence hinders their interest in involvement.

Table 5. Answer to the "parents' behaviors"

	Experienced	Not
Role modeling	197(6.7)	2764(93.3)
Encouragement and reinforcement	1075(36.2)	1892(63.8)
Provision of activity-related experiences	594(20.1)	2356(79.9)
Parent-child activity	515(17.4)	2446(82.6)

Figures 1, 2, and 3 show the responses to questions about parents' value, expectation, and self-efficacy by experiences or lack thereof in involvement behaviors. Since the item about role model had very few responses as "experienced," it was excluded from the analysis. Through the Mann-Whitney test, it was confirmed that there was significant statistical difference ($p < 0.05$) for all items between experienced or not experienced. This suggests that parents who had become involved with children's learning have positive beliefs about programming education than who those did not.

With regard to the parents' value, more than 80% of respondents with experience of involvement in each domain and more than 60% without experience indicated "Very" or "Somewhat" for each item. Overall, it can be assumed that parents recognize the value of learning programming. On the other hand, a small number of them did not recognize the value at all.

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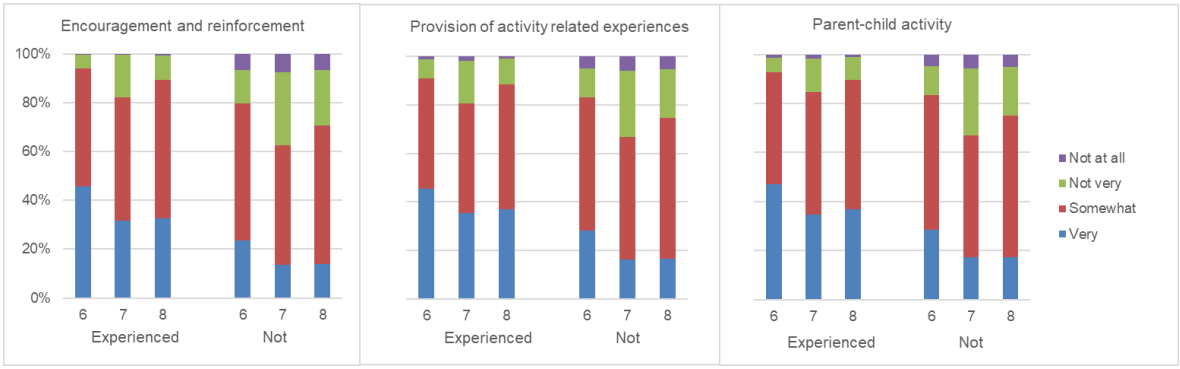

Figure 1. Answer to the "parents' value

With regard to the parents' expectation for children, 70–80% of respondents with experience of involvement in each domain indicated "Very" or "Somewhat" with regards to their children's interest in or their liking of programming. By contrast, less than 40% of respondents without experience indicated similar responses. Expectations for children might lead to parental involvement behaviors.

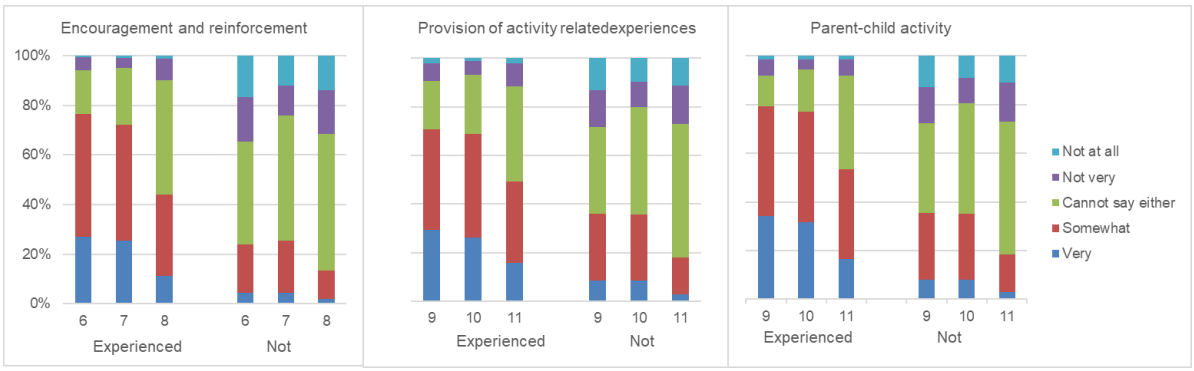

Figure 2. Answer to the "parents' expectations"

With regard to parents' self-efficacy, nearly 80% of respondents without experience of involvement in each domain indicated "very" or "not at all" with regard to if they are confident. Lack of confidence might be hindering parents from becoming involved. On the other hand, of the respondents with experience of involvement in encouragement, those that indicated they were "very," or "somewhat" confident were not so high, at 40%. Talking with children is considered relatively easy for even parents with less confidence.

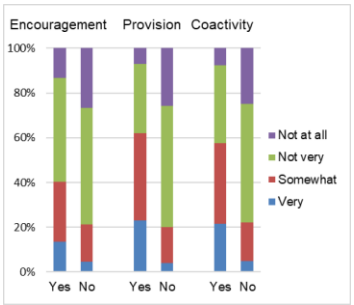

Figure 3. Parents' self-efficacy

4. CONCLUSIONS

To understand the current situation of parental involvement at the beginning of programming education, this study aimed to know parents' experience in being involved with programming education and their beliefs that motivated them.

With regard to parental involvement, parents' experiences were surveyed in four domains, i.e., role modeling, encouragement and reinforcement, provision of activity-related experiences, and parent-child activity. The results showed parents involvement in children's programming education is negligible. Even with regard to encouragement, less than 40% of respondents experienced involvement. It This suggests that parents may need some support to become involved. With regard to parental beliefs, the results showed that parents generally recognize the value of learning programming and their expectations for the child might lead to parental involvement behaviors. A lack of confidence might also be hindering parents from involvement.

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