An International Comparison of School Children's Awareness, Attitudes and Motivation towards "Making Things" (*mono- zukuri*) in England and Japan

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Summary

The purpose of this study was to investigate differences in awareness, attitudes and motivation of school children in Japan and the United Kingdom towards "making things" (*mono-zukuri*). At the same time, the study aimed to determine differences in the importance given to the experience of "making things" throughout childhood (in both school and everyday life) for Japanese and British children. The study covered a total of 12,531 Japanese children in 50 schools and 1,914 British children in 15 schools. The research was carried out using a written questionnaire.

The results were as follows:

① British children showed a higher awareness than Japanese children of the value of making things.
② British children displayed a higher degree of self-esteem for making things than Japanese children.
③ Japanese children showed a higher degree of autonomy in making things than British children.
④ Greater experience of making things from an early age may heighten children's interest in work.
⑤ The experience of making things in childhood is quite important for development and motivation.

1) Purpose

In the 1970s, Terauchi and Morishita (1974) noted that Japanese children were losing their manual dexterity. For instance, children could not sharpen a pencil with a knife or use tools well. Borrowing a metaphor from dentistry, they wrote that "children have cavities in their hands." At present, even 40 years after this study, modern Japanese children still lack the basic manual skills to allow them to use tools effectively.

Nowadays, there are still circumstances were children lack ability to integrate all necessary aspects of handling tools while making things. This applies not only to children but also to university students.

In the 1990s, Kono and Ohtani (1999) reported similar problems. Some Japanese school children, for example, declared "I'm not good at making things." Others didn't even try to make things during technology education classes. Yet other children threw their work into the garbage immediately after finishing.

Based on these examples, Sudo (1979) argued that children not being able to use tools well was not the only problem. A larger problem was their lack of interest in making things and their skewed sense of values about making things, which served to undermine their healthy development, both physically and mentally. This issue is a significant problem directly affecting technical education in Japanese schools.

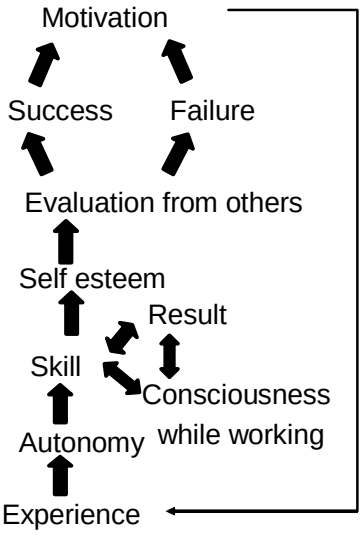
In order to promote increased interest in technology in Japan, a law was enacted in 1999 entitled the *Basic Act for the Promotion of Core Manufacturing Technology* (*Monozukuri Kiban Gijutsu Shinkou Kihonhou*). Article 16 of this act sets forth the aim of advancing the study of technology. This called for technology education to be integrated into schools in a consistent form from elementary to junior high school. However, there are several important problems related to this.

First of all, at present, Japanese technology education is carried out only in junior high schools. Secondly, there is little research data available to ensure the smooth integration of technology education from elementary through to junior high school in a consistent manner. Thirdly, there is little comparative data on differences in school children's awareness, attitudes and motivation to make things between Japan and other countries.

In the UK, school curricula guarantee that technology education is provided in schools from elementary level to secondary level. In Japan, this type of comprehensive curriculum for technology education is not yet fully in place.

In one study, Doi (1998) researched the relationship between elementary school children's awareness of making things and their age. It was found that children's interest in making things decreased from 5th grade to 6th grade. In a further study, Doi and Takashima (2008) found no significant relationship between children's performance and their awareness of not being good at making things.

The present study aimed at investigating differences in the awareness, attitudes and motivation of school children towards "making things" (*mono-zukuri*) in Japan and the United Kingdom. The study also aimed at determining differences in the importance given and the influence of the experience of "making things" throughout childhood (in school and everyday life) for Japanese and British children.



Structure of questionnaire for making things

2) Method used

The research approach used in this study was the questionnaire method. Identical questionnaires were drawn up in English and Japanese for British and Japanese school children. The survey was carried out for Japan in 2006 and for England in 2007. The questionnaire contained 43 questions, arranged into 8 categories: *skill* (11 questions), *self-esteem after getting results* (3 questions), *evaluation from others* (3 questions), *motivation* (10 questions), *experience and environment* (6 questions), *the gap between anticipation and acquired results* (3 questions), *autonomy* (3 questions) and *feelings while making things* (4 questions).

Children ranked their answers on a five-point scale. The survey was a cross-sectional study of school children from 4th to 10th grade. The number of subjects in Japan was: 4th grade children (1,080), 5th grade children (1,026), 6th grade children (1,187), 7th grade children (1,102), 8th grade children (3,000), 9th grade children (2,766), and 10th grade children (2,449). The number of subjects in the UK was: 4th grade children (437), 5th grade children (580), 6th grade children (402), 7th grade children (94), 8th grade children (245), 9th grade children (138), and 10th grade children (69).

The number of schools which took part was: Japan (50) and England (15). The total number of school children who took part was: Japan 12,531 (M 6,408, F 6,123) and England = 1,914 (M 1,010, F 904).

3) Results and Analysis

To investigate differences between Japanese and British school children, the average scores in 315 cases for each national group were examined (45 items each for 7 years). In 221 of these 315 cases, highly significant differences between the UK and Japan were found. In 170 of these 221 cases showing significant differences (54% of all cases), British children scored higher than children in Japan. This indicates that awareness of making things among British school children seems much higher than among Japanese school children.

① Differences in self-image, self-confidence, perseverance and evaluation by others.

An examination of the results showed 7 questionnaire items in which the UK had a higher significant difference compared to Japan throughout all grades. These items were as follows: (Q2) *I think I'm good at making things.* (Q6) *I can proceed with work according to my own plan.* (Q17) *I can make things faster than others can.* (Q18) *I'm confident that I can make things well.* (Q32) *Even if I make a mistake while working, I can still make the final product look good.* (Q33) *My parents often tell me, "You're*

good at making things!" and (Q37) *When I've finished making something of my own, I think it looks good.* These questionnaire items are related to (a) school children's sense of being good at making things well, (b) the self-confidence that school children can make things according to their own plan, (c) school children's feeling that they can complete what they want to make, and (d) evaluation by others.

② Differences in home environment, self-esteem and concentration.

British children scored significantly higher than Japanese children up through 6th grade on the following questionnaire items: (Q13) *If I want to make things at home, I can easily find the materials I need.* (Q28) *When I see something I've made, I think "That's well done!"* (Q29) *When I'm busy making something, I concentrate so much that I often don't notice when someone calls me.* (Q39) *I often watch TV shows about making things.* (Q40) *My friends often tell me, "You're good at making things!"* (Q42) *At home, there are a lot of books about how to make things.*

These items are related to (a) the environment at home, (b) children's sense of self-esteem, (c) evaluation by others and (d) school children' s ability to concentrate. In short, for these items, what was important was whether school children can make things at home or not, evaluation by others, and factors which heighten their sense of self-esteem. In contrast, there were no questionnaire items on which Japanese school children scored significantly higher than British children for all 7 grades, and only one such item for 6 grades. This was (Q27) *When I am making something, I don't need somebody to help me at the beginning.* This item is related to autonomy and indicates that Japanese children may be somewhat more autonomous than British children in making things.

③ Differences in attitudes, awareness and motivation.

The average score for the item "(Q1) I like making things." in both countries was 2.5 or over in all year grades (Fig1). This shows that school children in both Japan and the UK like making things.

The average score for British children's attitudes of "(Q2) I think I'm good at making things." was 2.5 and over in all year grades (Fig2). The average score, for Japanese children in grade 5 or above for this item was 2.5 or less. The average for British children was 2.5 or over in all grades. The average score for

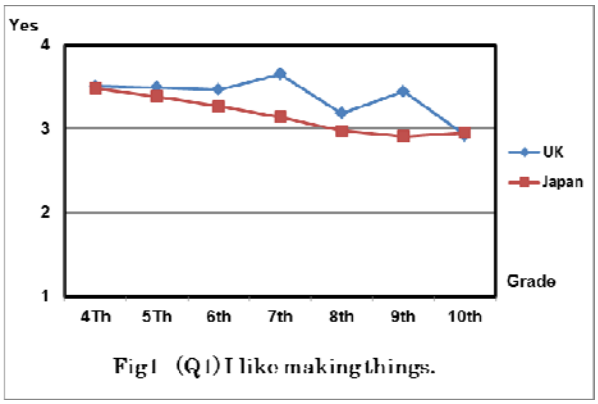


Fig1 (Q1) I like making things.

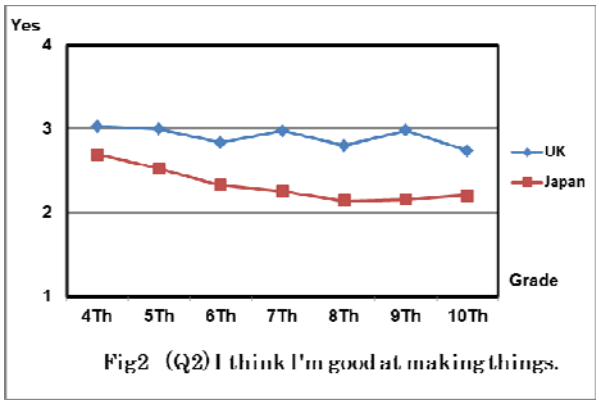


Fig2 (Q2) I think I'm good at making things.

British children was thus higher than for Japanese children, with a statistically significant difference ($p<.05$).

The average score, for British children for "(Q6) I can proceed with work according to my own plan."

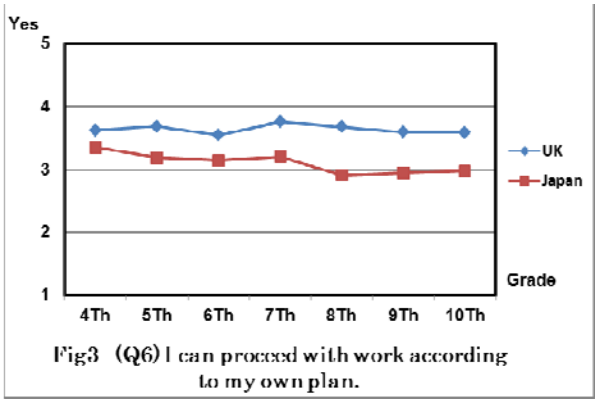


Fig3 (Q6) I can proceed with work according to my own plan.

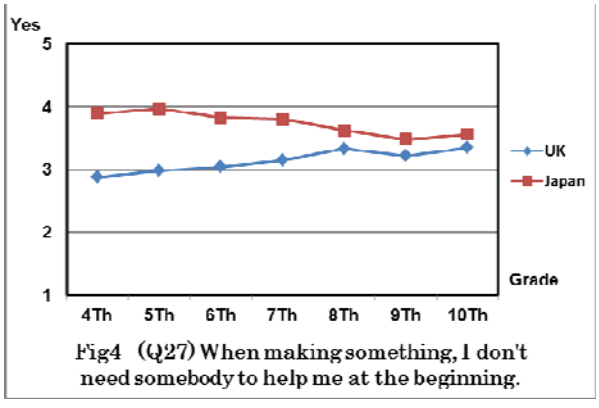


Fig4 (Q27) When making something, I don't need somebody to help me at the beginning.

was higher than for children in Japan in all grades, with a statistically significant difference ($p<.05$) (Fig3).

The average score of British children for the item "(Q27) When making something, I don't need somebody to help me at the beginning." was lower than for children in Japan for all year grades, with a statistically significant difference (except 10th grade) ($p<.05$) (Fig4). This result indicates that Japanese children may have a higher sense of autonomy than British children. However, if teachers demand excessive autonomy, school children can have difficulties in communicating with each other and in developing good human relations.

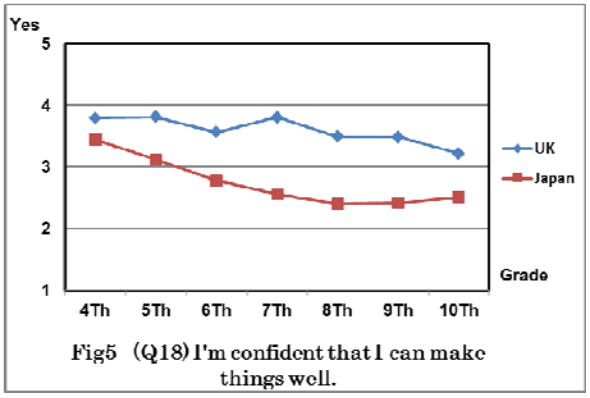


Fig5 (Q18) I'm confident that I can make things well.

The average score for British children for the item "(Q18) I'm confident that I can make things well." was higher than for children in Japan in all grades, with a statistically significant difference ($p<.01$) (Fig5). This result indicates that British children may have a higher sense of self-esteem than Japanese children.

The average score for British children for the item "(Q33) My parents often tell me, 'You're good at making things!' " was higher than for children in Japan in all grades, with a statistically significant difference ($p<.05$) (Fig6). The average score for British children for the item "Friends often tell me, 'You're good at making things!' " was higher than for children in Japan in all grades, with a statistically significant difference (except 10th grade) ($p<.05$) (Fig7). This kind of praise from peers and parents may help to cultivate British children's sense of self-esteem.

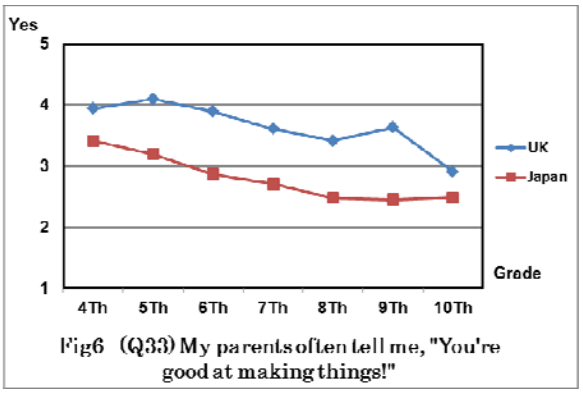


Fig6 (Q33) My parents often tell me, "You're good at making things!"

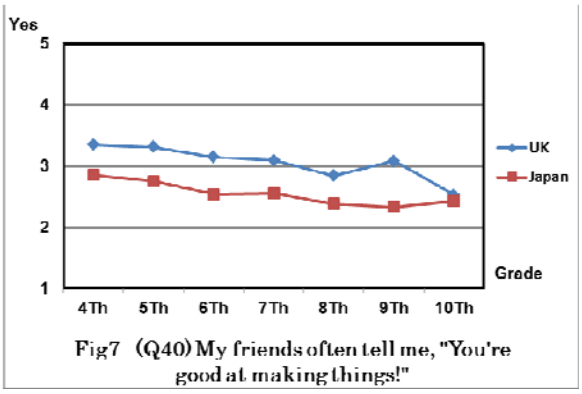


Fig7 (Q40) My friends often tell me, "You're good at making things!"

The average score for British children for the item "I want to see how creative people work to make things." was higher than that of Japan in all year grades, with a statistically significant difference ($p<.05$). In a previous survey of secondary school students in Japan (Doi 1999), the results for this item were lower than the results of 2006 for all year grades.

The study also investigated differences in awareness among school children who had much experience of making things in childhood and those who had little experience ,a comparison was made of the differences in average scores between these two groups for 308 items (per grade in 44 items). In the UK, in 216 out of 308 cases, British school children who had much experience of making things in childhood showed a higher significant difference compared with British children who had little experience, comprising 70% of all cases. Similarly, in Japan, 288 out of 308 cases showed a higher significant difference for Japanese school children who have much experience of making things, comprising 93% of all cases. From this data, it can be seen that the experience of making things in

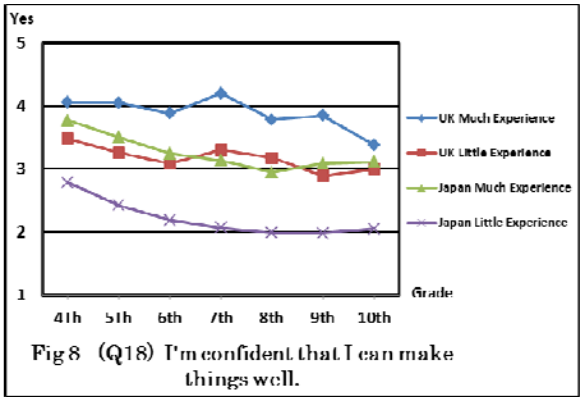


Fig 8 (Q18) I'm confident that I can make things well.

childhood is quite important, as can be seen from the results of "(Q18) I'm confident that I can make things well." (Fig8). An awareness of much past experience in making things from an early age may heighten children's confidence in making things. In terms of awareness, attitudes and motivation towards "making things", the gap between the group with much experience and the group with little experience was wider for Japanese school children than for British children.

Moreover, it was found that the majority of school children who said they were "interested in people who work to make things" had much experience of making things in their childhood (Fig9).

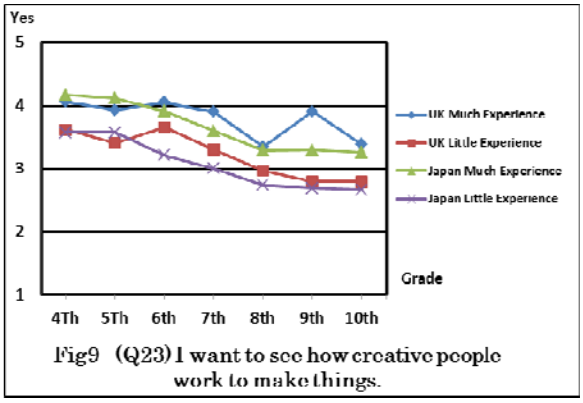


Fig9 (Q23) I want to see how creative people work to make things.

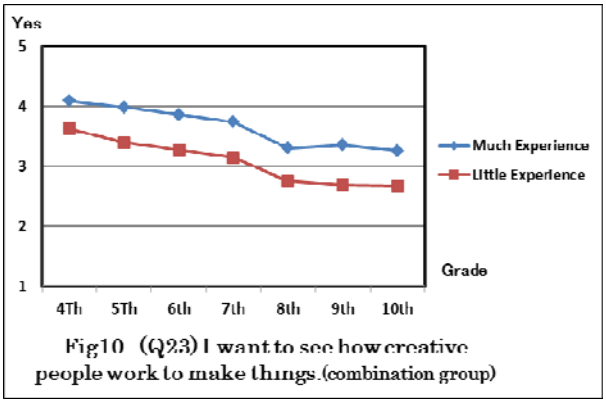


Fig10 (Q23) I want to see how creative people work to make things.(combination group)

The average score for the combined group of British and Japanese children with much experience of making things for the item "I am interested in people who work to make things." was higher than that of the combined group of British and Japanese children with little experience in all year grades, with a statistically significant difference ($p<.01$) (Fig10). Based on this data, we can conclude that school children's experience of making things in childhood may heighten their interest in working.

4) Conclusion

This study had two main purposes. The first was to investigate differences in Japanese and British school children's awareness, attitudes and motivation towards "making things" (*mono-zukuri*) as a first step towards integrating technology education into school education in Japan in a consistent manner from elementary through to junior high school level. The second purpose was to investigate differences between Japan and the UK in the role given to technology education in schools and in the influence on Japanese and British school children of the experience of "making things" (in school and everyday life) throughout childhood.

The results were as follows:

① British children showed a higher awareness than Japanese children of the value of making things.
② British children displayed a higher degree of self-esteem for making things than Japanese children.
③ Japanese children showed a higher degree of autonomy in making things than British children.
④ Greater experience of making things from an early age may heighten children's interest in work.
⑤ The experience of making things in childhood is quite important for development and motivation.

In this paper, although the differences in awareness, attitudes and motivation of school children towards "making things in Japan and the United Kingdom" are examined, the causes for the results are not mentioned, such as the main reason why British school children's awareness of making things is higher than Japan's school children, and the rich experiences of making things many times make children have high interests in productivity.

Therefore, examinations about self-esteem and bringing up attitudes and so on in both countries are still needed for a better and further understanding.

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6) Acknowledgments

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