

# Relations of Motivation to Learn and Self-Awareness of Skills for Using a Saw in Junior High School Materials and their Processing

Shinichi HARADA

*Faculty of Education*

*Kyoto University of Education, 1 Fujinomori-cho, Fukakusa Fushimi-ku Kyoto, 612-8522, Japan*

Satoshi FUJIKAWA

*The United Graduate School of Professional Teacher Education*

*Hokkaido University of Education, 9, kitakaido-cho, Asahikawa-shi, Hokkaido, 070-8621, Japan*

Shigeki ANDO

*Faculty of Education*

*Kyoto University of Education, 1 Fujinomori-cho, Fukakusa Fushimi-ku Kyoto, 612-8522, Japan*

**Abstract-** We examined, analyzed and verified how much motivation for learning and self-awareness of skills for using a saw junior high school students have in materials and their processing in technology education, as well as how much experience of production they had at primary school and at home before entering junior high school. The response to students' questionnaires shows that, in terms of the materials and their processing, first-grade and third-grade students scored higher than second-grade students, and thus we deduced that there are significant differences in the factor of motivation to learn about production. Further, regarding self-efficacy in production practice and self-awareness of skills for using a saw, second-grade students and third-grade students have a stronger feeling of competence than first-grade students, and a significant difference can be seen in almost every category.

**Keywords** –Materials and their processing, Learning Motivation, Self-efficacy, Tool Use, Self-awareness of Skills.

## I. INTRODUCTION

In the field of technology within junior high school technology and home economics education (“technology education” hereafter), gaining basic knowledge and skills on materials, processing, energy conversion, nurturing living things, and information through practical and experiential learning activities, such as production, should be emphasized.<sup>[1]</sup> We think it important in learning production in technology education that teachers have a clear understanding of what experiences their students have already had, their motivation for learning and how they become aware of the skills for using a saw.

For the research on motivation to learn in technology education, Higa is currently studying the factorial structure that heightens motivation to learn in the technology education classes through the survey performed on to the teachers of technology education.<sup>[2]</sup> Kato and Ichige have also clarified the structure of students' motivation to learn technology education in general<sup>[3]</sup> and Okuni and Tsukamoto focus on relating the motivation to dynamics.<sup>[4]</sup> Further, Moriyama studied the structure of students' motivation to learn in the field of metalworking and attempts to utilize the structure in improving the quality of classes.<sup>[5]</sup>

In order to have a clear understanding of motivation to learn in the technology education classes, we have up to now conducted a scaling to be used for the technology education classes, analyzed the changes and characteristics of motivation to learn, and considered the methods employed for instructing students.<sup>[6][7]</sup> However, each one of these studies was only conducted on the students' motivation to learn production or their motivation in the technology education classes, but did not clarify the students' experiences in production or motivation to learn production before entering into junior high school, the motivation's relation to the self-awareness of skills for using a saw, or other aspects.

For this study, we conducted research on the level of experience in learning production that junior high school students had when in primary school or at home before entering junior high school. Furthermore, we analyzed and

considered how the students' previous experience in production affected their motivation to learn about production, their self-efficacy in production practice, or their self-awareness of skills for using a saw.

## II. RESEARCH CONDUCTED

### A. *Research target and when it was conducted* –

Target: 118 first-grade students (55 boys, 63 girls), 133 second-grade students (65 boys, 68 girls), and 132 third-grade students (83 boys, 49 girls): a total of 383 students (203 boys, 180 girls) from a junior high school in Kyoto City.; period: May-June 2013

### B. *Research method* –

Students wrote their answers in the questionnaire sheet that was delivered to them. Prior to conducting the survey, the questions were recorded on a recording medium. The recording was used every time the survey was conducted and the students wrote their answers in accordance with the recording so as to pursue a high degree of uniformity in the survey, which was performed in units of one class.

### C. *Contents of the research* –

The contents of the research on motivation to learn technology and self-efficacy are as follows:

- 1) Motivation to learn during production classes<sup>[8]</sup>
- 2) Self-efficacy during practical classes
- 3) Level of awareness for production practice
- 4) Self-awareness of skills for using a saw
- 5) Regarding experience in making things at school or at home.

Multiple answers were given to the questions. As for item 2), upon conducting the practice of learning production, we aimed to measure how competent the students feel and how strong the feeling was. Therefore, we divided the degree of the feeling competent into ten levels so that the students could visualize their feeling numerically.

After conducting the survey for item 2) of self-efficacy during practical classes, we set a scale from ten points to one point corresponding to the ten levels of intensity of feeling competent. For the rest of the items, we had prepared 4-choice answers, and after the survey, we converted the choices into numbers: If the answer to a question is “Yes, I think so,” it equals four points; “I rather think so:” three points; “I rather think not:” two points; and “I do not think so:” one point.

Three teachers who had more than 20 years of teaching experience in technology education carefully considered the appropriateness of the above items and their quantification, made questions, compiled the answers, and repeatedly analyzed and discussed the results.

## III. RESEARCH RESULTS

### A. *Motivation to learn production*

Figure. 1 indicates the average score of each sex for motivation to learn production. Although no significant difference can be discerned between the two sexes, girls score higher in the motivational factors of “request for support” such as “when being helped by friends” and “when the teacher helped me.” This shows that girls expect support from friends and teacher in production process.

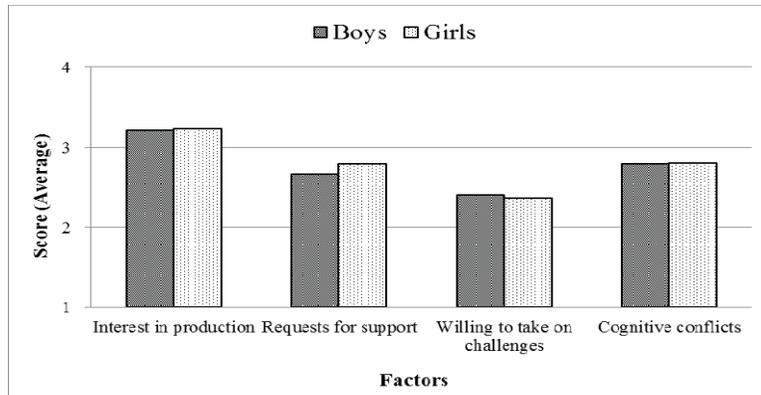


Figure 1. Motivation to learn production (difference between the sexes)

When the students are divided into two groups, a higher group (G) and a lower group (P), according to the points scored in “experience in production at school or at home,” the higher group scored more in all factors, and, as seen in Figure 2, a significant difference between the two groups is discernible.

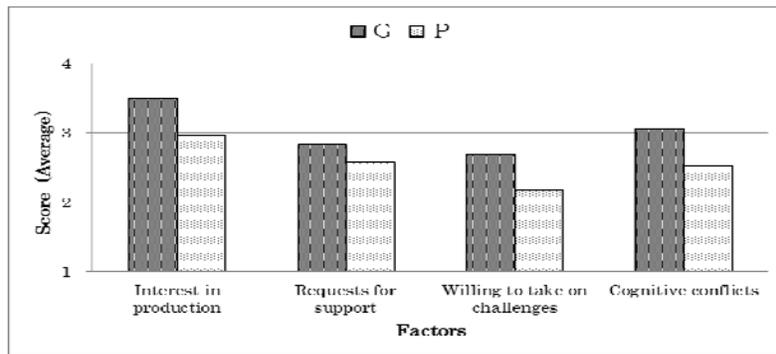


Figure 2. Motivation to learn production (GP)

Figure 3 indicates the average score of each grade. First-grade and third-grade students scored higher than second-grade students with respect to almost all the factors, and a significant difference between the three groups is discernible.

Furthermore, a correlation between “Motivation to learn in the production classes” and “Experience in production at school or at home” can be discerned.

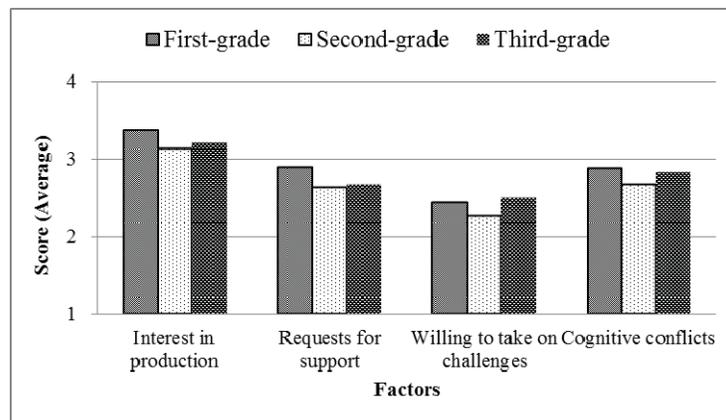


Figure 3. Motivation to learn production (difference between the grades)

### B. Self-efficacy in the production practice

We classified production abilities into 12 categories and measured the level of conviction in pursuing goals in the production classes.

#### (1) Evaluation of the measurement scale

Table 1 shows the categories, average points, standard deviations, and correlation coefficients between each category and the whole. The average for each category is between 3.10 and 7.56. The standard deviation is in the range of 2.27 to 3.05. The correlation coefficient between each category and the whole ( $r$ ) is within the range of 0.56 to 0.82. All the figures show a significant difference, and therefore, all 12 categories were adopted as scales to measure self-efficacy in production practice.

Table 1 Self-efficacy in production practice

| NO | Categories  | Average | Deviation | I-T Correlation |
|----|---|---------|-----------|-----------------|
| 1  | Able to cite the procedures for carrying out a task   | 3.10    | 2.27      | 0.56            |
| 2  | Able to choose tools and machines that are pertinent to the task  | 4.24    | 2.44      | 0.68            |
| 3  | Able to use a saw and perform vertical and horizontal pulling against the direction of the wood grain                                   | 3.89    | 2.76      | 0.73            |
| 4  | Able to fix materials and cut them using a saw  | 5.11    | 2.75      | 0.81            |
| 5  | Able to use a saw from a position to see the straight line of the saw's top edge  | 4.86    | 2.73      | 0.82            |
| 6  | Able to cut materials by pulling a saw  | 5.92    | 3.05      | 0.77            |
| 7  | Willing to work with a saw  | 5.58    | 2.81      | 0.78            |
| 8  | Able to push the gimlet downward and make a hole by rotating the gimlet in the palms of both hands                                      | 5.89    | 2.81      | 0.71            |
| 9  | Able to use a hammer with the elbow as the fulcrum, not by using the power of the wrist   | 5.23    | 2.79      | 0.77            |
| 10 | Able to distinguish the flat side and the round side of a hammer and drive in a nail by making use of the different sides of the hammer | 5.62    | 3.05      | 0.76            |
| 11 | Able to cooperate with others and work safely   | 7.09    | 2.41      | 0.66            |
| 12 | Able to put away the tools and materials that were used   | 7.56    | 2.35      | 0.61            |

#### (2) Results obtained using the measurement scales

As Figure. 4 indicates, boys score higher in self-efficacy in production practice. As seen in Figure. 5, when the students were separated into a higher group (G: top 25%) and a lower group (P: bottom 25%), according to the points scored in the category of "Experience in production at primary school or at home," the higher group (G) scored more points in all categories, and significant differences can be recognized. Furthermore, as Figure. 6 indicates, the second- and third-grade students have stronger feelings of competence, and significant differences can be seen in almost every category.

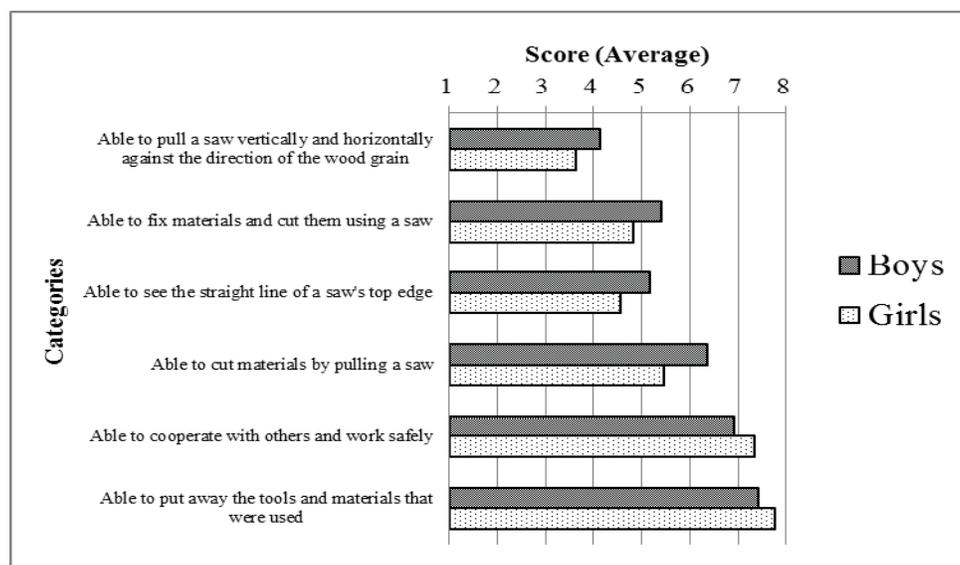


Figure 4. Self-efficacy (level of conviction) in the production practice

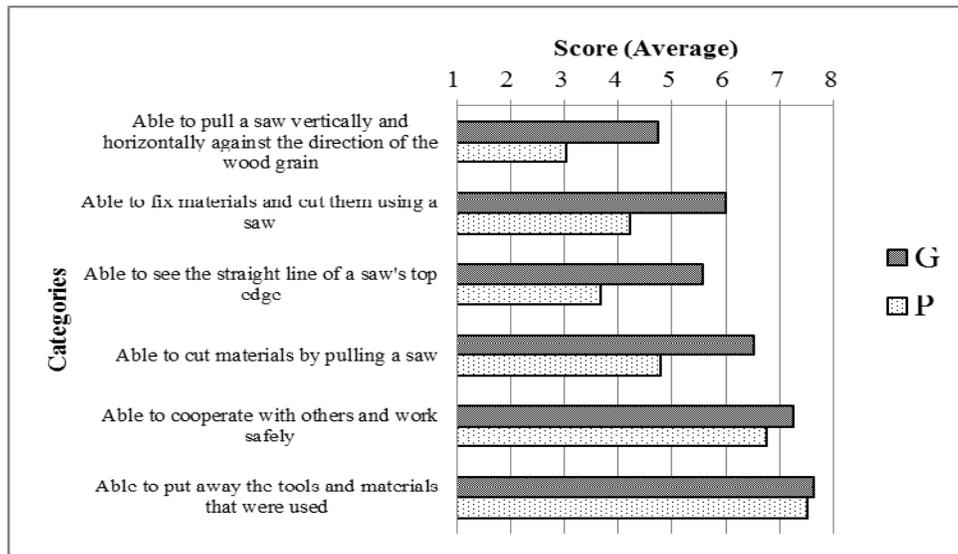


Figure 5. Self-efficacy (level of conviction) in the production practice

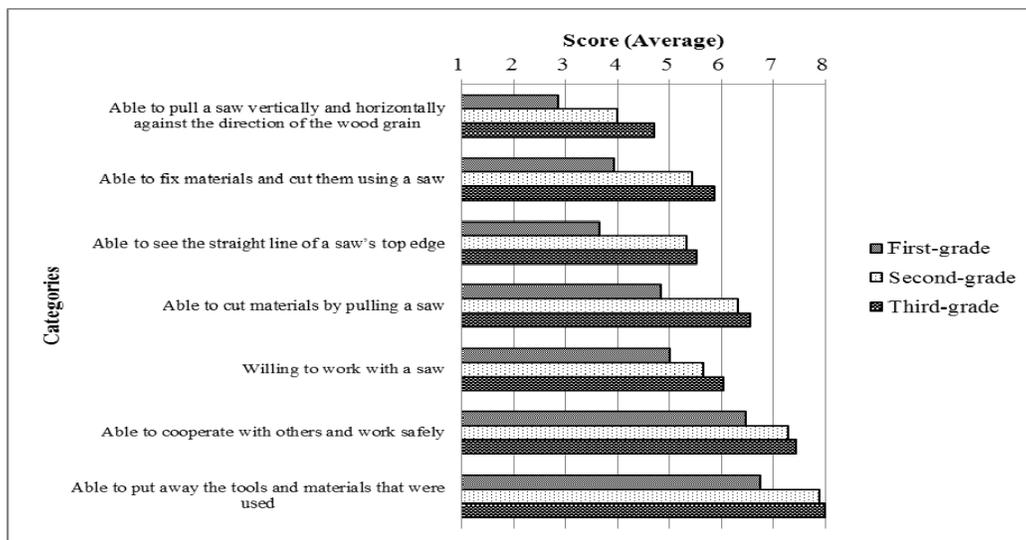


Figure 6. Self-efficacy (level of conviction) in the production practice

C. *Consciousness to learn production*

As Figure.7 indicates, for the students' level of awareness for learning production, the first-grade and third-grade students score higher, and significant differences can be seen in the categories of "Cooperating with friends is fun," "I can create a work procedure and work accordingly," "The practice starts at preparation and ends at clearing up," and "I will make use of the practice in my future life." In one of the preceding researches, Taura surveyed the students' attitude toward the technology education classes and pointed out that the second-grade students were found to be slacking and losing interest in overall school life.[9] From this research, we conclude that there is a tendency for motivation, attitude and other emotional aspects to result in a low score for second-grade students.

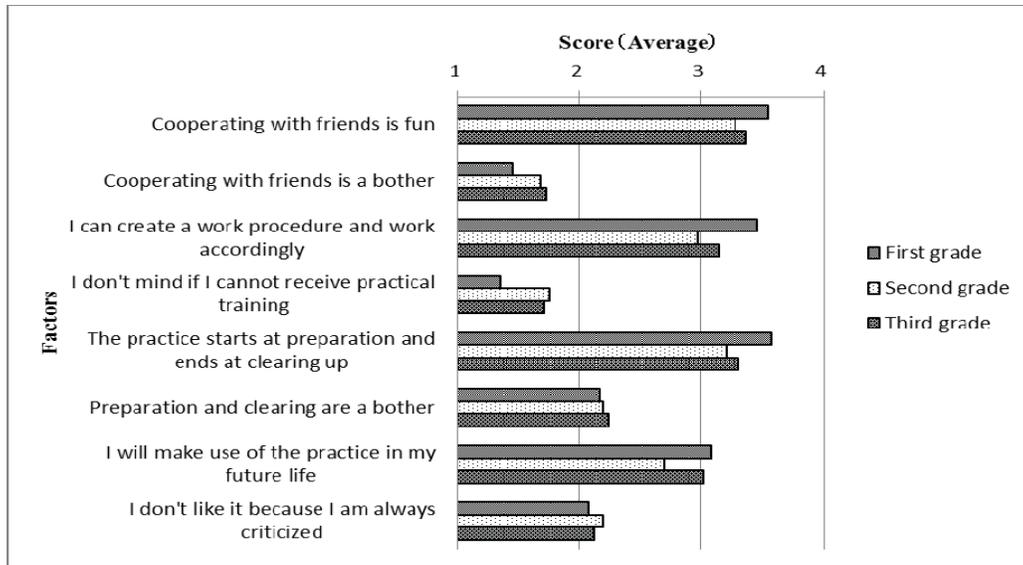


Figure 7. Level of awareness for learning production

D. Self-awareness of skills for using a saw

As Figure. 8 indicates, the second-grade students and third-grade students score higher than the first-grade students, and a significant difference is discernible in almost every category. The results show that the second-grade students and third-grade students have stronger feelings of competence in the use of tools.

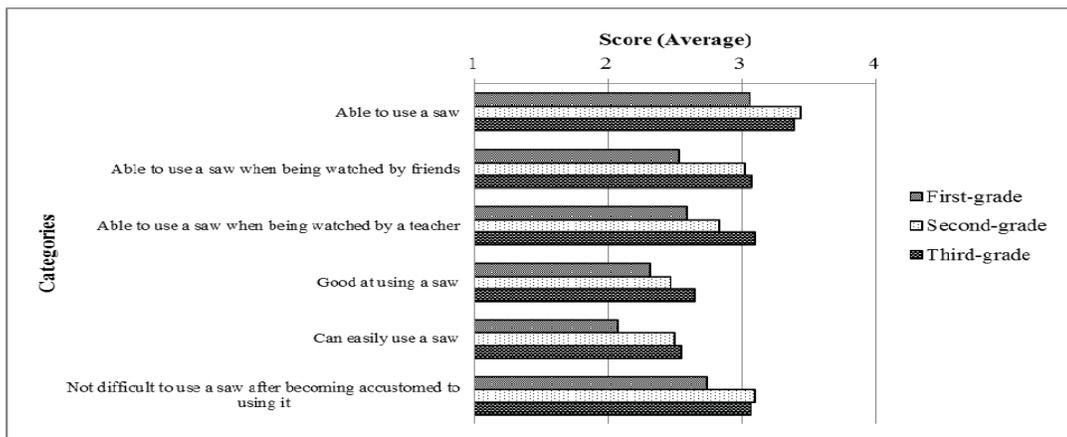


Figure 8. Self-awareness of skills for using a saw (difference between the grades)

E. Experience of production through school or home

As Fig. 9 indicates, all school years scored high in “having much experience in production in childhood” and “having experience of failure,” and it can be seen that the students had much experience in production, such as in handicrafts before entering junior high school. On the other hand, “Often taught about production by family” and “Welcomed to help the family with production” are scored low. It can be speculated that there is little family contact through production. Furthermore, the second-grade students and third-grade students score higher points for self-efficacy in production practice and self-awareness of skills for using a saw. It can be deduced from this that the learning experience of using a saw and other things the second-grade students and third-grade students had in the production classes gave them knowledge and skills, and subsequently led to their high self-efficacy in production practice.

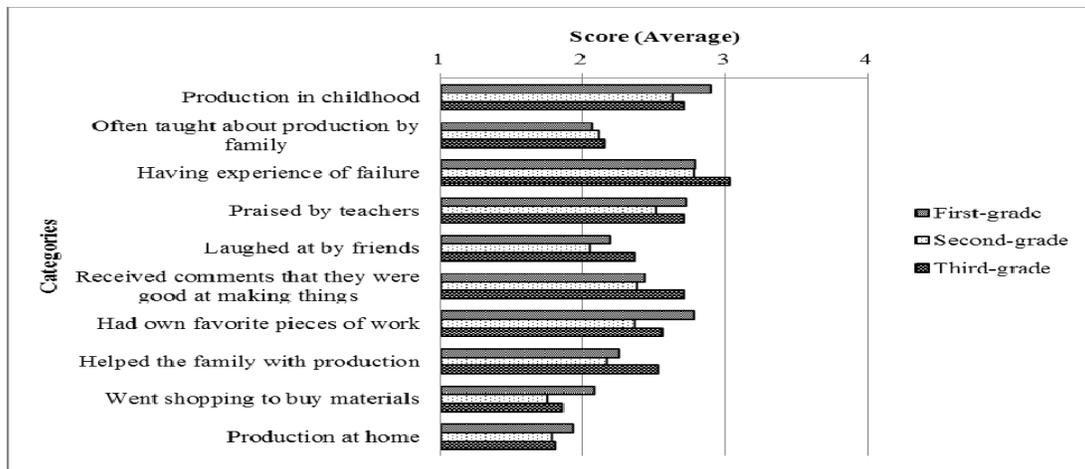


Figure 9. Experience at school or at home (difference between grades)

#### IV. CONCLUSION

To follow up this paper, we are considering performing a quantitative analysis on changes of the students and verifying comprehensively all the grades. Based on these studies, we will create a curriculum of technology education for the three grades of junior high school, work on scheduled evaluation activities and develop the desired subject matter for teaching material and teaching aids.

Further to the above, we plan to conduct at different junior high schools additional surveys which can provide general knowledge, and also perform qualitative analyses by focusing on unique students and other subject matter.

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