

The Relation of Motivation to Learn and Self-Awareness of Skills for Using a Saw in Kyoto Junior High School attached to Kyoto University of Education

Shinichi HARADA

Faculty of Education

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

Shigeki ANDO

Faculty of Education

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

Yuu OZAWA

Graduate School of Education

Kyoto Junior High School attached to Kyoto University of Education, 1, Koyamaminamiono-cho, Kita-ku, Kyoto, 603-8163, Japan

Abstract- In this paper, the authors conducted a survey involving the students at Kyoto Primary and Junior High School attached to Kyoto University of Education (hereafter referred to as Kyoto Junior High School), on the subject of the students' experiences in production (monozukuri) at home or at elementary school as well as their motivation to learn and self-awareness of skills for using a saw in technology and home economics. As a result of the analyses and consideration, with respect to motivation for learning in production, no difference between male and female students was discernible in the factor "Support requests." This indicated that the environment of the attached junior high school is assumed as a factor of self-learning since the tendency is different from that of public junior high schools. In addition, it implied that in learning production, making students finish producing a product and feel a sense of accomplishment serves as a factor to raise the motivation for learning in production and consciousness towards production.

Keywords – Learning production, Motivation to learn, Self-awareness of Skills for Using a Saw

I. INTRODUCTION

As a series of studies relevant to this paper, we conducted a survey and analysis on how students' experiences in production until they enter junior high school influence their motivation for technology education classes and self awareness of skills for using tools. With respect to motivation for learning production, it was found that female students tend to want friends and teachers to be involved with them while learning production. As for self-awareness of skills for using tools, female students have a strong sense of fear or weakness when using a saw, hammer, or drill. It was also found that experience in using tools at home or in primary school before entering junior high school is a factor for reducing fear or anxiety. These findings indicate that proper demonstration on how to use the tools and devising guidance that reduces students' anxiety are important for learning production [1]-[4]. The authors conducted a survey at three public junior high schools with different types of community and family environments, on the subject of students' motivation for learning production (monozukuri) and self-awareness of skills for using a saw in technology education in junior high school. As a result, students more experienced in production indicated higher motivation for learning in production and higher consciousness to learn production. In addition, with respect to self-awareness of skills for using a saw, a tendency was found for male students to feel more competent and female students to have a strong sense of fear or weakness. These characteristics between male and female students were the same among three schools [5].

As no entrance examination was conducted in these public junior high schools, they can be considered as diverse learning groups in which a wide range of students in both academic ability and family environments are enrolled.

On the contrary, as Kyoto Junior High School holds an entrance examination, it has almost the same quality students from the perspectives of both academic ability and motivation to learn and can be considered as a controlled learning group.

The previous studies considered motivation for learning and self-awareness of skills for using a saw in learning production at public junior high schools. However, they did not reveal the relation of motivation for learning and self-awareness of skills for using a saw in technology education between attached junior high schools and public junior high schools.

The purpose, the extent of the students' experience related to learning production at home or at elementary school before entering Kyoto Junior High School was surveyed. Furthermore, analyses and consideration were conducted on motivation to learn and self-awareness of skills for using a saw.

II. RESEARCH METHOD

A. *Research Target and When It Was Conducted* –

A survey was conducted for 308 students of Kyoto Junior High School (144 boys and 164 girls), including 82 seventh grade (first grade of junior high school) students (40 boys and 42 girls), 111 eighth grade students (52 boys and 59 girls), and 115 ninth grade students (52 boys and 63 girls). It was carried out in April 2014.

Kyoto Junior High School initiated the all-through school education for nine years from elementary school through junior high school levels in FY2010, integrating the elementary school and junior high school facilities.

With respect to the family environments, although there are many relatively rich families, two-income families are increasing. The parents are devoted to education and the participation rate on parents' visiting days is also high.

Although a lecturer without teaching experience had taken charge of the classes in technology education until FY2013, a regular teacher of technology education with more than 10 years of teaching experience has assumed that position since FY2014.

The seventh grade students have already taken guidance classes for three hours and have had the 3-year outlook for what kind of ability they are going to build in technology education at junior high school. The subject of production of seventh-grade students was making a bookcase, an accessory case, or other products within 13 hours using a "variety pine" kit, and all the students could complete their products. Although eighth and ninth grade students have also performed the production of a "bookcase" kit in learning production in the seventh grade, there were many students who could not complete their products.

B. *Research Method and Research Content*–

Students wrote their answers on the questionnaire sheet that they received. The content of the research on the motivation to learn production in technology education and self-awareness of skills for using a saw is as follows.

The questions were set as: (1) Experience of production at home or at elementary school, (2) Motivation for learning in production classes in technology education [6][7], (3) Consciousness towards learning production, (4) Self-awareness of skills for using a saw. In addition, in order to conduct a survey on self-awareness, we use tools commonly used for learning production in technology education and arts and handicrafts in elementary schools, and a well-known tool, the saw.

Answers to the questions were selected from among choices. With respect to the questionnaire sheet, we prepared 4-choice answers, and after the survey, we converted the choices into numbers: If the answer to a question was "Yes, I think so," it was allocated 4 points; "I somewhat think so:" 3 points; "I somewhat think not:" 2 points; and "I do not think so:" 1 point.

Three teachers who had more than 10 years of teaching experience in technology education carefully considered the appropriateness of the above items and quantification and prepared the questionnaire sheet.

III. RESEARCH RESULTS

A. *Experience of Production at Home or at School*–

As Table 1 indicates, with respect to the question on “Experience of production at home or at school,” the average scores on “Production in childhood” and “Having experience of failure” tend to be high. Between male and female students, male students scored higher than female students on “Having experience of failure” and a significant difference is discernible.

This indicates that both male and female students have accumulated the experience of production to some extent in crafts at home or in arts and crafts education at elementary school before entering junior high school. On the other hand, the scores on “Often taught about production by family” and “Appreciated by the family for helping them with production” are low. It can be inferred that they have less experience in contact with family in a medium of production and that this result indicates a tendency of the relationships in modern families. Similar results were obtained in public junior high schools on these matters.

Table -1 EXPERIENCE AT ELEMENTARY SCHOOL OR AT HOME

Categories	Male		Female		p-Value
	Average	Deviation	Average	Deviation	
Production in childhood	2.81	1.03	2.72	0.98	0.45 ns
Often taught about production by family	2.16	1.01	2.05	0.97	0.35 ns
Having experience of failure	3.17	0.82	2.88	0.97	0.00 **
Praised by teachers	2.63	0.98	2.40	0.93	0.04 *
Laughed at by friends	2.24	1.01	1.95	0.91	0.01 *
Received comments that they were good at making things	2.40	0.95	2.21	0.90	0.07 ns
Had own favorite pieces of work	2.44	1.03	2.26	1.01	0.12 ns
Helped the family with production	2.40	0.93	2.27	0.91	0.20 ns
Went shopping to buy materials	1.94	0.89	1.73	0.81	0.03 *
Production at home	2.07	0.99	1.77	0.90	0.01 *

N=308, Variance analysis (NA), *p<.05, **p<.01

B. Motivation for Learning Production in Technology Education–

Table 2 shows the average scores of male and female students on “motivation for learning in production” in technology education. With respect to the factor “Production desire” of motivation to learn, both male and female students tend to have high average scores. Moreover, in comparison to female students, male students indicate higher average scores on the factor “Challenging thinking,” and a significant difference is discernible. In particular, among the five categories composing the factor “Challenging thinking,” “When I think it is a little difficult while conducting the production of a product or an experiment” and “When I challenge difficult contents” exhibit a tendency to be scored high.

In addition, focusing on the factor “Support requests,” it was found that there is no great difference between male and female students. In the survey of public junior high schools, in comparison to male students, female students showed higher average scores on the factors for “Support requests” such as “When I was helped by friends” and “When the teacher helped me to produce my product.” It indicates a tendency that female students want friends and teachers to be involved with them while learning production.

Table -2 MOTIVATION FOR LEARNING IN PRODUCTION
(BETWEEN MALE AND FEMALE STUDENTS)

Categories	Male		Female		p-Value
	Average	Deviation	Average	Deviation	
Production desire	3.28	0.68	3.10	0.63	0.02 *
Support requests	2.70	0.68	2.65	0.63	0.55 ns
Challenging thinking	2.68	0.71	2.41	0.68	0.00 **
Cognitive conflict	2.81	0.72	2.66	0.65	0.06 ns

Variance analysis (NA), * $p < .05$, ** $p < .01$

Consequently, it was found that the students of Kyoto Junior High School, both male and female, constitute a learning group that can learn independently without depending on the others.

Furthermore, as a result of considering each relation between factors as seen in Table 3, with respect to partial correlations between factors after learning in production, significant correlations of the factor “Cognitive conflict” with the factors “Production desire,” “Support requests,” and “Challenging thinking” are discernible. In particular, the middle level of positive correlation of 0.47($p < .01$) is recognized in the correlation with the factor “Challenging thinking.” In addition, the partial correlations between factors by sex also indicate a similar tendency. Consequently, it was found that the factor “Cognitive conflict” is related to the other three factors. Similar results were also obtained in public junior high schools.

Table -3 PARTIAL CORRELATION BETWEEN THE FACTORS OF MOTIVATION
FOR LEARNING IN PRODUCTION

	F1 (Production desire)	F2 (Support requests)	F3 (Challenging thinking)	F4 (Cognitive conflict)
F1	—			
F2	0.01 **	—		
F3	0.24 **	0.14 **	—	
F4	0.38 **	0.36 **	0.47 **	—

Subsequently, Table 4 shows the average scores on motivation for learning by grade. The motivation of seventh and eighth grade students is higher than that of ninth grade students. With respect to the factors “Production desire” and “Challenging thinking,” significant differences among grades are discernible.

Table -4 MOTIVATION FOR LEARNING IN PRODUCTION (BY GRADE)

Categories	Seventh-grade		Eighth-grade		Ninth-grade		p-Value
	Average	Deviation	Average	Deviation	Average	Deviation	
Production desire	3.32	0.52	3.27	0.69	3.00	0.68	0.00 **
Support requests	2.60	0.65	2.74	0.67	2.66	0.65	0.28 ns
Challenging thinking	2.69	0.68	2.56	0.74	2.39	0.67	0.01 *
Cognitive conflict	2.82	0.59	2.78	0.74	2.63	0.67	0.10 ns

Variance analysis (NA), * $p < .05$, ** $p < .01$

C. Consciousness towards Learning Production–

As Table 5 indicates, with respect to consciousness towards learning production between male and female students, male students score higher than female students on “I can create a work procedure and work accordingly” and “I will make use of the practice in my future life,” and significant differences are discernible. According to these results, it was found that male students have higher consciousness towards learning production.

As for consciousness towards learning production by grade as seen in Table 6, seventh and eighth grade students tend to score much higher than ninth grade students.

The scores for the ninth grade are low. One factor for this is considered to be that when the students were in the seventh grade they were taught by a part-time teacher who had only one year's teaching experience, and they were unable to complete the workpiece at that time.

Table -5 CONSCIOUSNESS TOWARDS LEARNING PRODUCTION
(BETWEEN MALE AND FEMALE STUDENTS)

Categories	Male		Female		p-Value
	Average	Deviation	Average	Deviation	
Cooperation with friends is fun	3.42	0.73	3.31	0.79	0.23 ns
Cooperation with friends is troublesome	3.25	0.83	3.24	0.86	0.89 ns
I can create a work procedure and work accordingly	3.33	0.75	3.09	0.77	0.01 *
Even if I cannot receive practical training	3.42	0.76	3.11	0.85	0.00 **
The practice starts at preparation and ends at cleaning up	3.56	0.60	3.45	0.63	0.12 ns
Preparation and cleaning are troublesome	2.78	1.07	2.67	0.97	0.36 ns
I will make use of the practice in my future life	3.15	0.73	2.70	0.81	0.00 **
Because it is pointed out, I hate it	3.01	0.87	2.80	0.84	0.03 *

Variance analysis (NA), *p<.05, **p<.01

Table -6 CONSCIOUSNESS TOWARDS LEARNING PRODUCTION (BY GRADE)

Categories	Seventh-grade		Eighth-grade		Ninth-grade		p-Value
	Average	Deviation	Average	Deviation	Average	Deviation	
Cooperation with friends is fun	3.43	0.72	3.41	0.82	3.27	0.73	0.27 ns
Cooperation with friends is troublesome	3.41	0.80	3.36	0.83	3.01	0.84	0.00 **
I can create a work procedure and work accordingly	3.34	0.76	3.41	0.68	2.90	0.77	0.00 **
Even if I cannot receive practical training	3.48	0.65	3.36	0.77	2.99	0.91	0.00 **
The practice starts at preparation and ends at cleaning up	3.61	0.54	3.63	0.55	3.29	0.67	0.00 **
Preparation and cleaning are troublesome	3.02	0.89	2.78	1.09	2.44	0.98	0.00 **
I will make use of the practice in my future life	3.04	0.82	3.08	0.78	2.65	0.75	0.00 **
Because it is pointed out, I hate it	3.13	0.81	3.07	0.85	2.56	0.80	0.00 **

Variance analysis (NA), *p<.05, **p<.01

D. Self-awareness of Skills for Using a Saw

Table 7 shows the average scores between male and female students on self-awareness of skills for using a saw in learning production. In the categories "Able to use a saw," "Bad at using a saw," and "Afraid of not being able to cut straight," male students score higher on average in comparison to female students, and significant differences are discernible. Accordingly, as for self-awareness of skills for using a saw such as "Able to use a saw," it was found that female students have a stronger sense of weakness or anxiety in using a saw. Similar results were also obtained in public junior high schools³⁾.

Table -7 SELF-AWARENESS OF SKILLS FOR USING A SAW(BETWEEN MALE AND FEMALE STUDENTS)

Categories	Male		Female		p-Value
	Average	Deviation	Average	Deviation	
Able to use a saw	3.53	0.62	3.31	0.74	0.00 **
Difficult to use a saw	3.03	1.01	2.84	0.99	0.09 ns
Bad at using a saw	2.97	0.90	2.60	0.95	0.00 **
Get nervous	3.33	0.87	3.39	0.83	0.56 ns
Afraid of being injured	2.77	1.05	2.63	0.99	0.23 ns
Not difficult to use a saw after becoming accustomed to using it	3.10	0.94	3.09	0.91	0.90 ns
Afraid of not being able to cut straight	2.47	0.94	2.09	0.87	0.00 **

N=308, Variance analysis (NA), *p<.05, **p<.01

Table -8 SELF-AWARENESS OF SKILLS FOR USING A SAW (BY GRADE)

Categories	Seventh-grade		Eighth-grade		Ninth-grade		p-Value
	Average	Deviation	Average	Deviation	Average	Deviation	
Able to use a saw	3.20	0.79	3.58	0.64	3.42	0.63	0.00 **
Difficult to use a saw	3.07	0.95	2.76	1.05	2.98	0.96	0.06 ns
Bad at using a saw	2.85	0.85	2.71	0.99	2.77	0.96	0.59 ns
Get nervous	3.29	0.90	3.45	0.75	3.33	0.91	0.39 ns
Afraid of being injured	2.76	1.01	2.61	1.05	2.73	0.99	0.57 ns
Not difficult to use a saw after becoming accustomed to using it	3.20	0.91	3.05	0.98	3.07	0.88	0.53 ns
Afraid of not being able to cut straight	2.51	0.96	2.17	1.02	2.19	0.91	0.02 *

N=308, Variance analysis (NA), *p<.05, **p<.01

By grade, as seen in Table 8, eighth and ninth grade students score higher on the category “Able to use a saw” and lower on the category “Afraid of not being able to cut straight” in comparison to seventh grade students. Significant differences are discernible respectively. Therefore, it can be inferred that seventh grade students have a sense of fear as they have not completed learning how to use a saw. In addition, it can be assumed that eighth and ninth grade students have higher awareness of “Able to use a saw” as they have already learned how to use a saw in practice. However, they score lower on “Afraid of not being able to cut straight” as they have experienced the difficulty in cutting straight.

IV. CONCLUSION

In this research, the following points were found.

As for the factor “Support requests,” a tendency that the difference between male and female students was not discernible in Kyoto Junior High School differs from that in public junior high schools. Moreover, in comparison to female students, male students indicate higher average scores for the “Challenging thinking,” and a significant difference is discernible. The environment where the attached junior high school is a controlled learning group is assumed as a factor to encourage the students’ independent learning.

With respect to self-awareness of skills for using a saw in learning production between male and female students, female students scored significantly higher on the category of weakness in all the tools. It indicated that they had a strong sense of weakness towards tools. As public junior high schools also showed a similar tendency, proper demonstrations on how to use the tools and devising guidance that reduces students' anxiety are important for the classes of learning production. Moreover, it was found important to connect the failure experience and a sense of fear and weakness to the next success as well as to let students have the experience of success while performing an assignment.

In addition, ninth grade students tended to have lower motivation to learn and consciousness towards learning production although they had higher awareness of "Able to use a saw." This indicates that having learned how to use a saw increased their sense of "Not difficult to use a saw after becoming accustomed to using it." It was found, however, that lower consciousness towards learning production such as "I will make use of the practice in my future life" reduced motivation for learning. Therefore, guidance to increase the significance of learning production was found necessary through devising the guidance classes in first grade to stimulate interest in production and letting students experience a sense of accomplishment by completing the production of products.

In the future, we will conduct surveys at more schools to quantitatively analyze and verify the transformation of students.

ACKNOWLEDGEMENT

This research is subsidized by the Scientific Research (C) of the Grants-in-Aid for Scientific Research under the research subject No. 26350232.

REFERENCES

- [1] Shinichi HARADA and Satoshi FUJIKAWA : The Relation between Motivation to Learn and Self-efficacy in Learning for Manufacturing in Technology Education, 2nd Japan - Thailand Friendship International Workshop on Science, Technology & Education, A3-008, pp.61-64, 2012.
- [2] Shinichi HARADA, Satoshi FUJIKAWA and Shigeki ANDO : Verification of Motivation to Learn and Self-Awareness of Skills for Using a Saw in Junior High School Learning Production (monodukuri), The Japan – Thailand – Lao P.D.R. Joint Friendship International Conference on Applied Electrical and Mechanical Engineering 2013 (JTLAEME '13), 3A-002, pp.37-40, 2013.
- [3] Shinichi Harada, Satoshi Fujikawa, Shigeki Ando, "A Study on the State of Learning Motivation and Self-awareness of Tool-using Skill for Object-making Learning in Technology Education." The Japan Society of Technology Education, Journal of the Japanese Society of Technology Education, vol.55, No.4, pp.253-260, 2013.
- [4] Shinichi Harada, Satoshi Fujikawa, Shigeki Ando : "Changes in Learning Motivation & Self - Awareness in Using Tools After Attending Object - Making Classes at a Junior High School Technology Class." The Japan Society of Technology Education, Journal of the Japanese Society of Technology Education, vol. 56, No. 3, pp. 187-195, 2014.
- [5] Shinichi Harada, Satoshi Fujikawa, and Shigeki Ando, "Comparison among Schools Related to Self-awareness of Skills for Using a Saw in Technology Education in Junior High School," 1st Asian Conference on Electrical Installation & Applied Technology 3rd Japan-Thailand Friendship International Workshop on Science, Technology & Education (1st ACEIAT and 3rd JTSTE), Proceedings, pp. 85-88, 2014.
- [6] Shinichi Harada, Masashi Matsuura, Shigeki Ando, "A Study on Motivation to Learn in Industrial Arts Class – The Development of a Scale to Measuring" The Motivation to Learn." The Japanese Society of Technology Education, *Journal of the Japanese Society of Technology Education*, vol.39, No.3, pp.191-196, 1997.
- [7] Shinichi Harada and Shigeki Ando, "Comparison in the Research on Students' Motivation in Learning Manufacturing and Information," The Japan Society of Technology Education, Study on Technology Education, vol. 12, pp. 7-14, 2007.