

How Students Construct of Flow in a Learning of Woodworking

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Abstract- This study aims to clarify the way in which students construct Flow in a learning process of woodworking. The chopstick making class with 59 students was selected to conduct survey. As a result, it was found that students' constructions of Flow in woodworking process were achieved by learning how to make chopsticks. The details of analysis are as follows: 1) Majority of students achieved the goal which was set up by themselves on making chopsticks. It was found that a chopstick making was an appropriate structural activity for students; therefore, students could easily find and achieve their goals in their learning process. It also indicates that this activity meets requirements of constructing Flow. 2) It was testified that there were differences in students' Flow on woodworking processes. There was a tendency that Flow reached its peak in plane phase to shift. It was also suggested that it was necessary to have preparation process and some difficulties on activity to reach a peak of Flow.

Keywords – Flow, woodworking, making chopsticks

I. INTRODUCTION

Some students could promote their development and growth by themselves through acquiring skills and attitude to be happy in their lives beyond school education and learning. The woodworking in this study means mainly the subject matter of technology education at Junior high school in Japan. However, this subject also aims to promote learners' creativities and autonomous attitudes [1]

Mihaly Csikszentmihalyi who identified Flow theory indicates that appropriate structural activities could harmonize concentration, self-development and control of consciousness; therefore, this harmony makes optimal experience (Flow) possible [2]. Based on this argument, it can be said that the woodworking is structural and concrete assignment which has a potential to provide optimal experience to learners. Csikszentmihalyi also explains that Flow guides people to develop and discover through two factors, "challenge" and "ability". According to this explanation, when people feel insecurity in their challenges, Flow will disappear. This implies that it is important to clarify students' feelings on process of woodworking.

The study of Flow on technology education is very limited in number. For example, Oota and Ando (2011) analyzed mental responses of two students who have aim-attaining experiences in objects making by employing "PAC Analysis" [3]. As a result, they elucidated how these two students structured their attitudes of pleasure and joy in making objects. In another study, Ando and Matuura (2009) examined Flow in technology education classes with observations, video analysis of classes, and survey[4]. They found that, in classes examined, a state of Flow was formed when students engaged in producing their works.

However, in my view, it seems that earlier studies do not clarify how students' Flow is constructed in woodworking. Therefore, this study attempted to clarify the way in which students' Flow was constructed in a learning of woodworking.

II. STUDY METHOD

2.1 Procedure –

To clarify a construction of students' Flow in a learning of woodworking, the class of making chopsticks was conducted in relation to curriculum content, "material and manufacturing" [1]. In addition, a survey was given to analyze how students in the class constructed Flow on woodworking.

2.2 The Content of Chopstick Making Class–

The content of chopstick making class was introduced as an easy step of woodworking. Using chopsticks is closely connected with Japanese life style. In addition, production and construction processes of chopsticks are simple: within a short amount of time, steps of production processes from marking to coating can be accomplished;

parts processing can be finished mainly with planning. Mashita, Mukaiyama and Enomoto (2007) suggested that chopstick making was an important learning subject on technology education and therefore it was necessary to be included as teaching material [5].

Based on the above discussion, chopstick making is chosen as an appropriate introductory topic of woodworking.

The content of class includes explaining history and culture, designing the length of chopsticks, marking, sawing, planing, sanding, coating, and using and reporting (see more details in Table 1).

2.3 Evaluation of Flow –

The survey with 6 items was prepared and conducted after session to evaluate students' Flow (see Table 2 for details). These 6 items were modified based on previous study by Tokuhisa and Inakage (2007) [6]. Items include subordinate concepts of Flow, such as clear goal, senses of control and immersion, shift in a sense of time course, and a sense of excitement. Each item is followed by open space in which students could write reasons of answer. Moreover students were asked to write down their impressions of woodworking after making chopsticks.

Students were informed that this survey would not affect students' grades, and then they filled out the survey within 15 minutes. The survey was conducted in June of 2011 with 59 first graders from three classes (22 boys and 37 girls) in one of junior high schools in Ishikawa prefecture.

Table 1 “Making chopsticks” learning plan (150min.)

Process (minute)	Content	Activity	Support	Goal	Evaluation
Introduction (25m)	Explain	• history and culture of chopstick	• explain with data and material of chopsticks.	① they could be interesting in making chopsticks.	are they interesting in making chopsticks.
Development (100m)	Design and Drawing	• length of chopsticks • drawing to material	• announcing appropriate length of chopstick. ○if student does not understand of length, teacher will measure the length.		
	Sawing	• learning how to use saw • cutting off extra length	• attention to close cut off the line. ○if student does not understand how to cut off, teacher will demonstrate how to cut.		
	Planing	• learning how to use plane • planing of material	• reviewing how to use plane. • reviewing wood grain, direction. ○if student does not understand how to use plane, teacher will demonstrate how to plane.	② they could understand grain for plane and safety working.	does they plane safety and appropriate direction.
	Sanding	• learning how to use sanding paper • finishing with sanding	• announcing roughness of sanding paper. • making sure sanding direction.		
	Coating	• learning how to coat with walnut • coating with walnut	• announcing how to coat with walnut. • distributing cloth to clean up.	③ they could positively work to make better.	does they make smooth surface of chopsticks and coating.
Conclusion (25m)	Using and Report	• practicing of using chopsticks with beans • looking back making chopstick	• distributing beans to each tables. • reviewing the point of making chopsticks. • announcing this subject matter is as introduction of “material and manufacturing”		

Table 2 Questionnaire of Flow on woodworking

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- ① Could you achieve your goal of the making chopsticks?(achieved, almost, not achieved)
- ② Which did you have the sense mainly on making chopsticks?(touch, hearing, sight, smell)
- ③ Have you controlled using a plane and sandpapering?(controlled, no control, fade away)
- ④ Have you absorbed this working? Which steps have you absorbed in?
(before, explanation, design, sawing, planing, sanding, coating, after, no)
- ⑤ Have you had a change of concerning with the time in this working? Which steps have you gotten the sense?
(before, explanation, design, sawing, planing, sanding, coating, after, no)
- ⑥ Have you exited in this working? Which steps have you gotten the sense? You could mark any numbers.
(before, explanation, design, sawing, planing, sanding, coating, after, no)
-

III. RESULTS

Students have made chopsticks safely in the class. They calculated appropriate length, and worked positively. Pictures of students' engaging in working and final products are below (see pic. 1 & pic. 2).

In the class, teacher explained history and culture of chopsticks first, and then he demonstrated working process. Students looked at pictures of working process very seriously. When they planed materials, they carefully checked the marking line and grain of wood. As plane progressed, they became quiet. In the step of sanding and coating, they made surface of chopsticks smooth and coated for better works.

After observations, in conjunction with survey results, students' works were analyzed to see how Flow was constructed in chopstick making process. Table 3 shows students' answers of achieving their goals in chopstick making. As a result of χ^2 analysis, a significant difference was found ($\chi^2(2)=85.7, p<.01$). From the number of answers, it could be said that majority of students achieved the goal which was set up by themselves in making chopsticks. One of requirement factors of construction of Flow is that activity has to have a clear goal. Therefore it could be concluded that the making chopsticks was an appropriate structural activity and students could easily find and achieve their goals in learning process. This proved that this activity meets requirements of constructing Flow. Also, students who did not achieve the goal mentioned about failure and lack of times as reasons for not achieving the goal.

Table 4 shows students' answers of experiencing senses while they were working. As a result of χ^2 analysis, a significant difference was found ($\chi^2(3)=116.1, p<.01$). From the number of answers, it could be said that majority of students felt the sense of touch. Many students wrote comments on how they felt about the surface of wood, such as "I had an impression that chopsticks gradually became smoother".



Pic.1 sanding



Pic.2 works

Table 3 Students' answers of achieving goal in chopstick making

①	achieved	almost	not achieved
a total of answer	53	6	0
percentage(%)	89.8	10.2	0.0

Table 4 Students' answers of experiencing the senses in working

②	touch	hearing	sight	smell
a total of answer	51	4	5	0
percentage(%)	85.0	6.7	8.3	0.0

Table 5 Students' answers of controlling skills in working

③	controlled	no control	fade away
a total of answer	38	21	0
percentage(%)	64.4	35.6	0.0

Table 6 Students' answers of immersing into the work

④	before	explanation	design	sawing	planing	sanding	coating	after	no
a total of answer	4	2	15	11	52	36	41	12	0
percentage(%)	2.3	1.2	8.7	6.4	30.1	20.8	23.7	6.9	0.0

Table 7 Students' answers of shifting a sense of time course in working

⑤	before	explanation	design	sawing	planing	sanding	coating	after	no
a total of answer	2	1	5	10	44	20	28	8	0
percentage(%)	1.7	0.8	4.2	8.5	37.3	16.9	23.7	6.8	0.0

Table 8 Students' answers of a sense of excitement for the work

⑥	before	explanation	design	sawing	planing	sanding	coating	after	no
a total of answer	11	7	17	14	38	21	38	15	0
percentage(%)	6.8	4.3	10.6	8.7	23.6	13.0	23.6	9.3	0.0

Table 5 shows students' answers of controlling skills in their works. As a result of χ^2 analysis, a significant difference was found ($\chi^2(2)=36.8, p<.01$). From the number of answers, it could be guessed that majority of students was aware of having a sense of controlling skills. Also many students wrote comments, such as "I could control to save the power not to plane too much.", which indicated how they managed to acquire skills as time progressed.

Table 6 shows students' answers of how they immersed into their works. As a result of χ^2 analysis, a significant difference was found ($\chi^2(8)=289.9, p<.01$). From the number of answers, it could be guessed that all of students were able to immerse into their works, mainly in the steps of planing, sanding, and coating. Some students made comments, such as "I was very focused, so did not care what was going on around me".

Table 7 shows students' answers regarding a sense of time course while they were working. As a result of χ^2 analysis, a significant difference was found ($\chi^2(8)=351.2, p<.01$). From the number of answers, it could be said that all of students experienced shifting a sense of time course as they worked. They felt so mainly in the steps of planing and coating. Some students felt the time passed quickly while some felt the time passed slowly and longer.

Table 8 shows students' answers of a sense of excitement in the work. As a result of χ^2 analysis, a significant difference was found ($\chi^2(8)=280.3, p<.01$). From the number of answers, it could be guessed that all of students were able to feel a sense of excitement, especially in the steps of planing and coating.

Based on the analysis above, it was clarified that in concrete activity like this chopstick making and introductive assignment, majority of students recognized subordinate concepts of Flow, such as a senses of immersion and shift in a sense of time course. As for senses of immersion and excitement as well as shift in a sense of time course, all of students recognized these, especially in the steps of planing, sanding and coating in woodworking. Therefore, it is concluded that woodworking have made a significant contribution in constructing Flow.

It also need to be mention that there was a tendency that Flow reached its peak in plane phase to shift as it was shown in Table 6, Table7, and Table8. For example, figure 1, which illustrates numbers from Table 6, shows when students had a peak of Flow. This indicates Flow was constructed differently according to the process in woodworking.

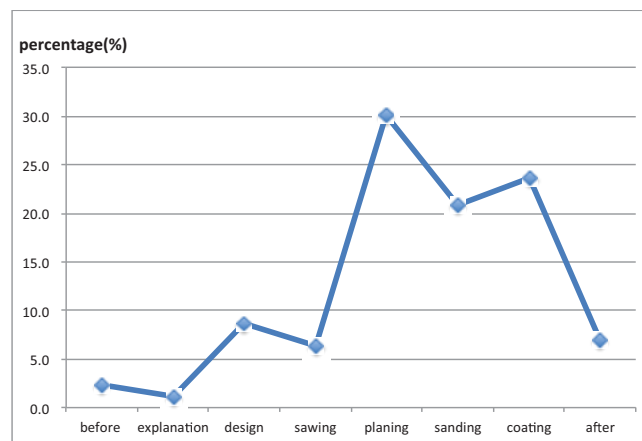


Figure 1 Peak of Flow

Table 9 Students' written comments in their works

A	At first, I thought it sounded fun after listening explanation. Planing was difficult for me but I could plane better than a practice. It was hard to make good size of chopsticks. Also, I am glad to make smooth and beautiful shape of it than I expected . I enjoyed a coating with walnut.
B	I could work smoothly each steps, but I guessed it would take longer than I thought to make chopsticks at first. I am glad that every step went smooth and I made beautiful surface by planing. I am very satisfied that the color got darker and deeper gradually when I coated with walnut, chopsticks was so beautiful after all.
C	At first, I felt it was not going to be fun and annoying when we were told to make chopsticks. But I gradually enjoyed and immersed into in the world of making chopsticks once I tried. I understand it is not easy to make chopsticks because planing needs patience and coating was needs more power. I enjoyed planing at first, but then it became hard to make chopsticks narrower. I have never concentrated on something like this. I feel pain in my eyes.
D	I enjoyed and focused on this chopstick making very much. The most fun part was planning . When I was planing I was so excited. It has been a long time that I concentrated on like this. Also, it was harder to make chopstick than I had expected. We use disposal chopstick usually, I think we had better to reduce the amount of using them .
E	I enjoyed making chopsticks very much . Especially I enjoyed planing and coating. I had never planed before, but I enjoyed it. It was difficult for me to design and make beautiful shape of chopsticks, but I am glad to finish of it. Finally I could make beautiful and functional chopsticks. I would like to join the ecology life style by using these what we call "my chopsticks" .
F	I got behind because chopstick was broken when I planed. I was disappointment at that time. But I could enjoy making chopsticks because these became beautiful in shape when I planed, coated and sanded. I would like remember how fun it was to make something beautiful.

Furthermore, it is suggested that it is necessary to have preparation process and some difficulties on activity to reach a peak of Flow. Table 9 shows students' written comments on making chopsticks. For example, student C pointed out the necessity of patience as well as some difficulties he felt in making chopsticks. This student also reported that he gradually enjoyed and immersed into a world of chopstick making. Student F mentioned that he made mistakes when he planed, however, later he found it enjoyable making chopsticks.

It is also analyzed that students were able to recognize their abilities of control as written in their comments, such as "I guessed it would take longer than I thought to make chopsticks at first." and "I am glad to make smooth and beautiful shape of it than I expected". These comments support the idea that it is important for students to balance out their own abilities and difficulties of assignment.

Furthermore, it could be pointed out that, by learning chopstick making, students became more environmental conscious, as written in comments such as, "I would like to join the ecology life style." and "We use disposal chopsticks usually, I think we had better to reduce the amount of using them". In making chopsticks, students had to balance out their own abilities and difficulties of assignment; it provided them an opportunity to cultivate a sense of environment friendliness.

IV.CONCLUSION

This study aims to clarify the way in which students construct Flow in a learning process of woodworking. The chopstick making class with 59 students was selected to conduct survey. As a result, it was found that students' constructions of Flow in woodworking process were achieved by learning how to make chopsticks. The details of analysis are as follows:

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