

Report

Reports on Trials of Support System for Mathematics Self-Instruction (SMSI) in NIT, Nagaoka College

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At National Institute of Technology, Nagaoka College (NITN), students must be well-grounded in general subjects to make good use of their research. But some students of low academic achievement have neither a habit nor the best way for them to study on their own at home and are distressed by their own problems. Moreover, some of these students want to solve their problems and improve themselves. As a support for them, we started trials of support system for mathematics self-instruction (SMSI) in December 2015. We emphasize that participants of SMSI joined this trial not under compulsion but of their free will. In SMSI, we, that is teachers, are only supporters for the students which makes them act on their own. In this paper, we introduce SMSI in 2015 and in the first semester of 2016. We also show the survey of questionnaires and test scores for attendees and consider the effects of SMSI.

Key Words: *study session, self-development, self-instruction, mathematics education, students of low academic achievement*

1. Introduction

National Institute of Technology, Japan (KOSEN) has been required to improve the quality and the level of its education. Our students must be well-grounded in general subjects to make good use of their research. But, in fact, some students of low academic achievement have neither a habit nor the best way for them to study on their own at home and are distressed by their own problems. Moreover, some of these students want to solve their problems and improve themselves.

In December 2015, we started a trial of support system for mathematics self-instruction (SMSI) with 12 third grade students of a regular course. We made use of "Prelab" system [1] of System Design

Innovation Center (SDIC) [2] in our school: National Institute of Technology, Nagaoka College (NITN). In May 2016, we started a next trial of SMSI with a new system improved by questionnaires and hearings with 9 third grade students of a regular course. Now, 15 students participate in SMSI. (Similar trial or class to improve the motivations and the effects of studying are introduced in [3] and [4].) We emphasize that participants of SMSI joined this trials not under compulsion but of their free will. In SMSI, we, that is teachers, are only supporters for the students which makes them act on their own.

In this paper, we introduce trials of SMSI in 2015 and in the first semester of 2016. We also show the questionnaires in 2015 and 2016, and the survey of

test scores in the first semester of 2016 for attendees. In the summary, we consider and discuss the effects of SMSI.

2. Aims, details and actual states of trials of SMSI

These trials of SMSI aims at 3 competencies: creating opportunities and a habit to study mathematics everyday, making a circle of friends for studying mathematics and obtaining fundamental ability for self-instruction. We introduce the details of trials of SMSI in 2015 and in the first semester of 2016.

2. 1 Trial of SMSI in 2015

In 2015, we made a trial of SMSI because there was a request of supplementary lessons from a few students. Our trial were the following:

(1) Defining roles of every student as “teachers” or “tutors”

We defined roles of every student attended in SMSI as “teachers” or “tutors”: We shared questions of their workbook to solve among the attendees and left markings and explanations of questions to them. Students also kept in contact by communication application “LINE”. We didn’t tell them either answers or solutions as much as possible. We gave only recommendations and checked their condition.

(2) Meetings

In order to check their progress, we held meetings about once or twice a week. Teachers also checked, grasped and helped to correct their plans for studying.

Unfortunately, these systems in 2015 didn’t work very well. The trial of SMSI in 2015 had been carried out from early December 2015 until the middle of January 2016. Moreover, we had a winter vacation for about three weeks. So the term of SMSI

in 2015 was very short. Because almost all participants were boarders and they had trouble coming to school during the long vacation, we utilized LINE in order to exchange information and teach each other. But, it was too difficult for them to spell out their questions and answers of math. And it seemed to be very important to build a good team and relationship between students for good communication and exchanging information. However, there seemed to be some effect in attendees to improve their motivation to study math by themselves in the trial of SMSI in 2015.

2. 2 Trial of SMSI at the first semester in 2016

In 2016, we started a next trial of SMSI improved by questionnaires and hearings of attendees in 2015. Our trial were the following:

(1) Setting student tasks to do everyday (“Suugaku Marathon”)

We set students only one question from their textbook or workbook for each day. Students solved the question and got scorings from us. We also checked and informed their progress. This aimed creating opportunities and a habit to study mathematics everyday. Hence we set questions from a basic level.

(2) Group Works (GWs)

About once a week, we held meetings and made opportunities to study or solve problems together. For example, students gave some questions which they couldn’t solve and discussed them. To study for the exam, they also set questions to each other and practiced as many questions as possible.

In 2016, we realized the importance of direct communication and participation type seminar, again. Though it was very short, making time to study math by “Suugaku Marathon” was effective for them to get their motivation and a habit to study math as shown in **section 3.2**.

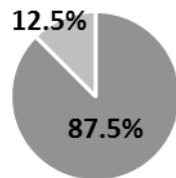
3. Questionnaires, hearings and test scores for attendees

We show questionnaires in 2015 and 2016, and the survey of test scores in the first semester of 2016 for attendees.

3.1 Survey in 2015 (questionnaires and hearings)

In 2015, for obtaining the reason why those systems didn't work very much and the period of implementation was too short to get enough data of test scores, we only sent out questionnaires and did hearings from attendees.

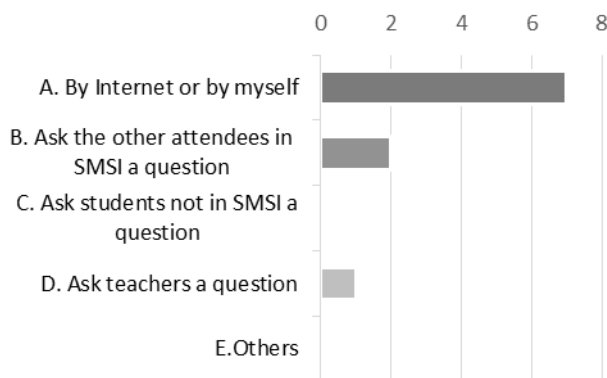
Because the system as in 2. 1(1) didn't work very well, most of the students solved questions by themselves and couldn't make a circle of friends for studying. But, as shown in Fig. 1.1 and Fig. 1.3, they got a way or a hint to study at home and felt a good point to join SMSI. As a solution as shown in Fig. 1.2 and Fig. 1.4, we also talked with a few students directly. According to these surveys, we needed a more simple system, a little sense of duty and ice-breaking to construct a good relationship between attended students.



■ I get. ■ I don't get.

The way or hint for self-instruction

Fig. 1.1 Effort of our aims.



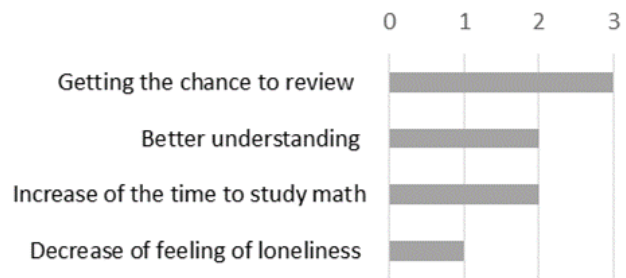
The way to solve problems

Fig. 1.2 Effort of our aims.

3.2 Survey in 2016 (questionnaires and test scores)

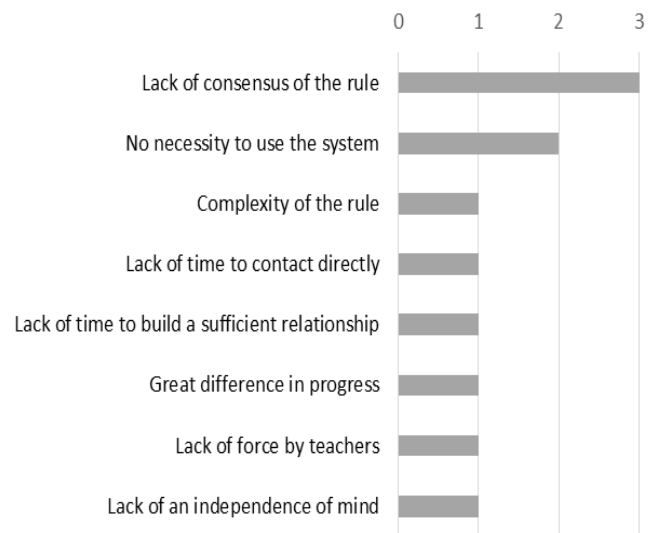
At the end of the first semester in 2016, we sent out questionnaires. We also checked the datas of test scores from 2016. We show only averages of the questionnaires.

In 2016, we changed the system to a more simple one with a little task for each day. We also spent enough time for ice-breaking to construct a good relationship for "Group Works" or discussion between attendees. We were able to get positive results from them about their motivation and confidence as shown in Fig. 2.3, Fig. 2.4 and Fig. 2.5. But some students couldn't obtain fundamental abilities for self-instruction as shown in Fig. 2.1 and Fig. 2.2.



Good point or benefit to join SMSI

Fig. 1.3 Comments of attendees.



The reason why their "teacher" system didn't work very much

Fig. 1.4 Comments of attendees.

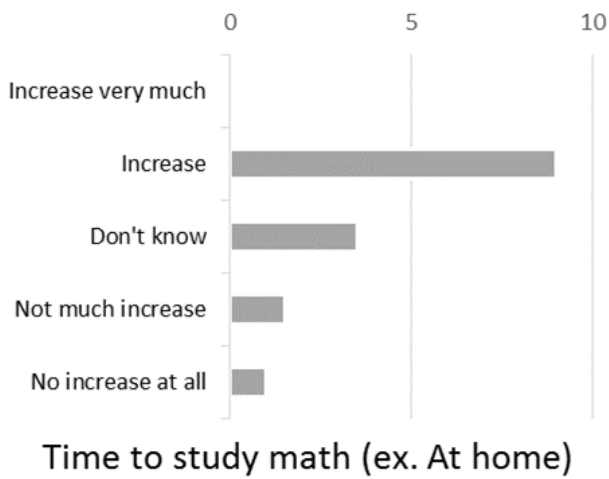


Fig. 2.1 Evaluation by students.

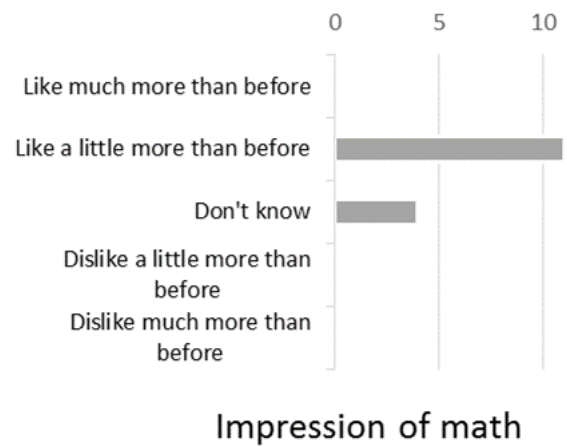


Fig. 2.4 Evaluation by students.

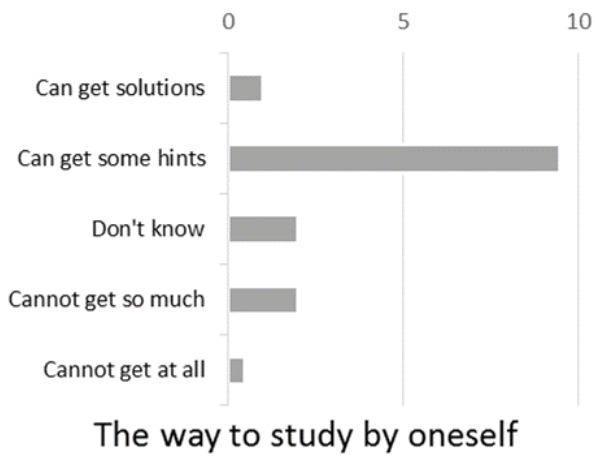


Fig. 2.2 Evaluation by students.

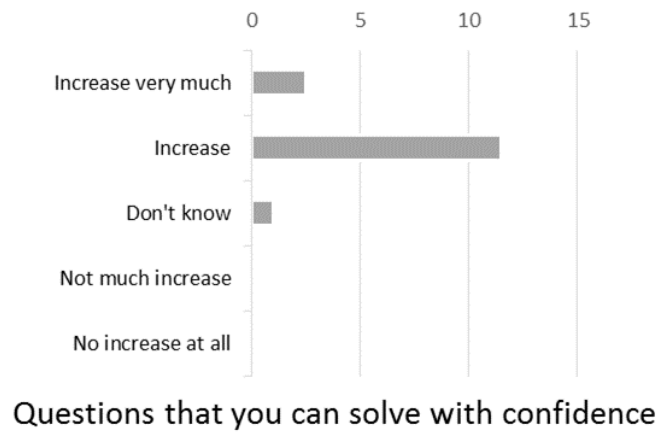


Fig. 2.5 Evaluation by students.

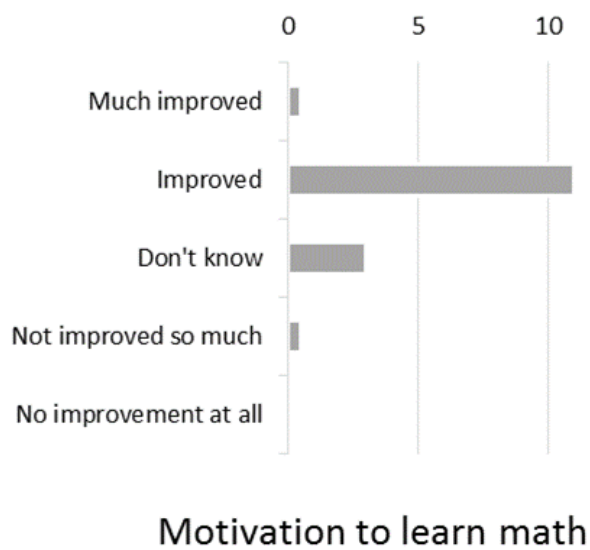


Fig. 2.3 Evaluation by students.

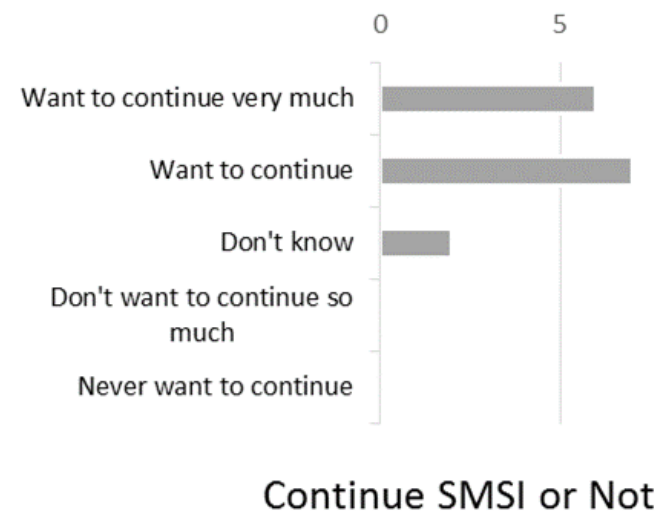


Fig. 2.6 Evaluation by students.

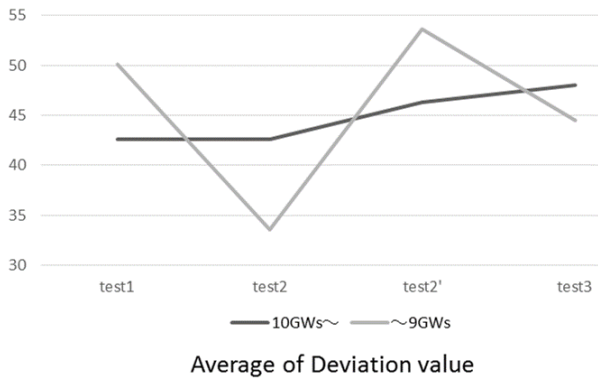


Fig. 2.7 Average score of tests.

We came under two categories as follows: students that participate in Group Works or GWs more than 10 times (“10GWs~”) and otherwise (“~9GWs”). Note that GWs were held 14 times in the first semester of 2016. We surveyed average scores of the two groups. In the group “10GWs~”, they also solved almost all questions prepared in “Suugaku Marathon” (35 questions.) Test 1 was held before the start of the trial of SMSI in 2016 and Test 2’ was the re-examination of Test 2. The trial of SMSI in 2016 was started just before Test 2, so the effect of the system at the earliest appeared from Test 2. The group “~9GWs” consisted of members who participated before Test 2’ and just after Test 2. As shown in Fig. 2.7, the average score was increasing in the group of students of frequent attendance. But the average scores of Test 1 and Test 2’ of the group “~9GWs” was higher than the other. On the whole, the average score of the group with the frequent attendance was increasing as they continued the trials of SMSI. But the dispersion of the other result was too large to judge whether SMSI was effective to the students or not.

4. Conclusion

In NITN, students must be well-grounded in general subjects to make good use of their research. But some students have neither a habit nor the best way for them to study on their own at home. Moreover, some of these students want to solve their problems and improve themselves. As a support for them, we made use of "Prelab" system of SDIC in

our school and started a trial of SMSI in 2015. By the reviewing of the trial of SMSI in 2015, we started a new system from May 2016. At the moment, we can see positive effects in the attendees, for example, their motivation. And students, who attend GWs frequently and solve almost all of questions of “Suugaku Marathon,” are getting better scores. But some students can’t obtain fundamental ability for self-instruction. We need more survey and to discuss a new system to follow problems as mentioned above.

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