

# DESIGN AND PRACTICE OF PRELIMINARY CLASS FOR A<sup>3</sup> LEARNING SYSTEM

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## ABSTRACT

Young students are strongly required to have increased ability of critical thinking, versatile adaptation and basic competency, and knowledge to survive a new age. We offer a new learning system called A<sup>3</sup> (Advance, Active and Autonomous) learning system to stimulate students to have active and autonomous learning attitudes and at the same time to aim for reducing teachers' load of conducting classes. In order to implement this system successfully a new course for the first year students was designed. The program specially designed to promote an active learning manner among students and to build up the foundation of generic skills was executed as a part of the new course.

## KEYWORDS

Active learning, Generic skills, Critical thinking, Global competency, New generation, Survival skills, Problem based learning, Project based Learning, Preliminary classes, Standard 7, 8

## INTRODUCTION

Today, the globalization of society, complex economic structure, global competency and rapid development of technology urge us to drastically modify our education styles so that young generation can adapt to such complex and rapid changes and survive. The Ministry of Economy, Trade and Industry in Japan proposed Fundamental Competencies for Working Persons consisting of 3 competencies and 12 competency factors as the survival skill in the 21<sup>st</sup> century as shown in Figure.1. In Dec. 2014, the Ministry of Education, Culture, Sports, Science and Technology in Japan submitted the report on the improvement of higher education for the new generation and emphasizes the importance of survival skills such as critical thinking, judgment and the ability to express oneself and implementation of active learning style education in the classroom.

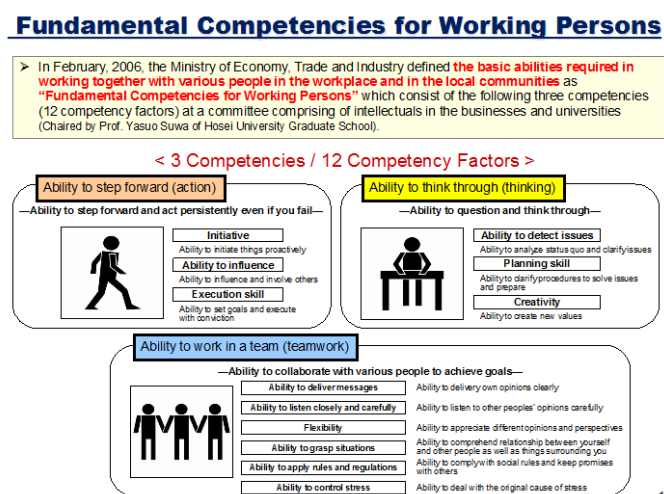


Figure 1. Fundamental Competencies for Working Persons defined by Ministry of Economy, Trade and Industry Japan in 2006

Adaptation to global society is also inevitable for young engineers who graduate from National Institutes of Technology (NIT) in Japan. National Institutes of Technology are well-known to be producing highly skilled engineers and to have long experience of PBL (Project/Problem based learning) education systems. Each institute offers the 5-year intensive education program to foster engineers with practical skills. Students enter the college at the age of 15 and continue developing his/her technical skills for 5 years. The importance of practical trainings is emphasized in the curriculum of every NITs. NIT Sendai College has also been offering the spiral education system with lectures followed by PBL-type practices. On the other hand, various newly developed technologies are changing the styles of learning and teaching drastically. The efficient use of IC technology and WEB technology expands the possibility of various learning styles of students. While we maintain the old good tradition in our educational system, we have yet to keep improving our system constantly to adapt to the global change, and making the best use of the latest ICT may provide us with feasible solutions for it.

Our college proposed a new learning system called A<sup>3</sup> (Advance, Active and Autonomous) learning system (Takahashi et.al., 2015). This system consists of Project/Problem based learning, Active learning and My-pace/Mastery learning and is expected to stimulate students to learn actively and autonomously and at the same time aims for reducing teachers' load of conducting classes. Students are sure to be strongly required to have increased ability of critical thinking, versatile adaptation, basic competency and knowledge to survive a new age. In order to meet such various requirements, we offer the A<sup>3</sup> learning system which flexibly matches each individual student with various degrees of knowledge, capability, interest and different background.

The preliminary educational program plays an important and key role for implementing the new learning system and developing it successfully. It is very important for us to foster students with positive attitudes toward learning in an early stage of the curriculum. We have to nurture student's motivation, and then create good learning atmosphere in classroom so that they appreciate the new learning style and start taking advantage of it.

We designed a new course of 30 weeks with various programs for the first year students to nurture such motivation for learning. The course is divided into several parts and each part is designed to build up the foundation of generic skills of students. As a part of this course, we delivered a three-week program. This program is specially designed to promote an active learning manner among students. We focused on bringing out major abilities for their future study in this program.

In this paper, we introduce the detailed contents of this program and then summarize our first trial based on the feedback from the students and teachers. The analysis of the feedback is reported and we will discuss further improvement based on the result.

## **A<sup>3</sup> LEARNING SYSTEM**

Various learning styles have been developed and implemented in response to the rapid change of the social structure and remarkable development of IT tools and/or WEB environment. For an example, MOOCs (Massive Open Online Courses) give people opportunities of taking courses more freely at any time anywhere by using WEB environment and a laptop or a tablet. JMOOC has dissolved the language barrier for Japanese who wishes to take such online courses. On the other hand IT has made it much easier for us to analyze a big volume of data such as learning records collected from each student year after year and to trace individual learning progress of each student. New learning styles, materials with better quality and ways of evaluation suitable to such online study have been developed.

The A<sup>3</sup> learning system consists of three types of learning styles (Fig.2). First, lectures are so designed that students can share knowledge in the benefit of Active learning. Students are expected to study in groups or by her/himself actively, sometimes with effective use of ICT, cultivating their learning skills while obtaining a certain amount of necessary knowledge. The second is PBL type lectures and practice, and students are expected to obtain various abilities

such as thinking ability, analyzing ability, communication techniques and competency from working experience on a project or encountering various problems. The third is so-called My-pace or Mastery learning style. Each student studies on individual pace to obtain complete and total knowledge for his/her future career and sometimes can ask for personal assistance or advice from an instructor to ensure their own understanding if necessary.

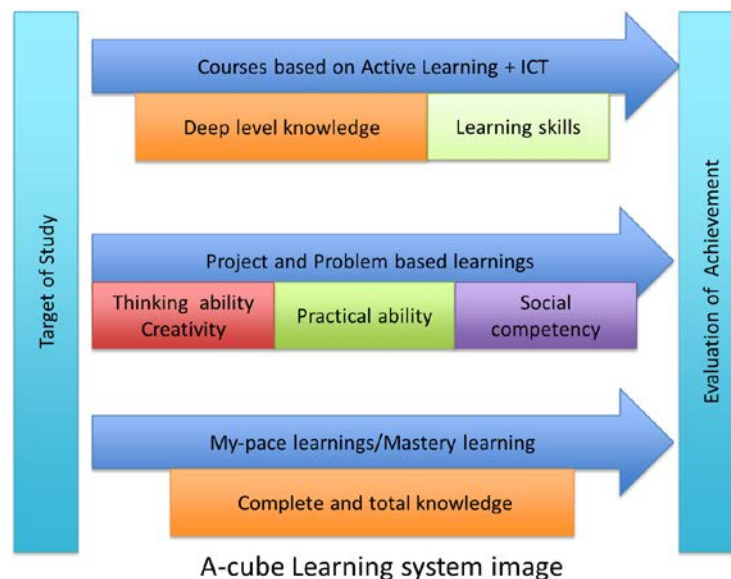


Figure 2. Three learning styles proposed in A<sup>3</sup> learning system

The school presents the standard criterion that students are supposed to reach during an academic year and evaluate their achievements at the end of that year based on the criterion. The whole curriculum should be designed as combinations of those three learning styles. Evaluation of active learning style is often likely to depend on rather subjective feeling. In order to evaluate the achievement of each student in a fair manner, we use PROG (Progress Report on Generic Skills) test which allows more objective evaluation.

PROG is the program developed by the collaboration of Kawai-juku education institution in Japan and Riasec Co. to foster generic skills of university students. PROG test consists of two types of multiple choice tests: a literacy test and a competency test (Ito, H., 2014). PROG is not an ordinary test measuring the amount of knowledge but is designed to measure how he/she responds, decides and acts to solve a problem by fully using of their own knowledge. The literacy test measures the ability to solve a problem with their own knowledge and the competency test measures general skills obtained from various experiences in the past.

It is expected that the A<sup>3</sup> learning system helps students to establish their own autonomous learning attitudes and flourishing communication skills among students, between students and teachers and even more so that students are able to gain extra learning benefits.

## PRACTICAL TRIALS IN THE PRELIMINARY COURSE FOR THE FIRST YEAR STUDENTS

Positive attitudes of students toward their study are the most important key to the successful implementation of the new learning system. In order to nurture such attitudes in the early stage of academic program we designed a new course for the first year students called the training course for generic skills. There are about 128 students in the first year, we split them in a half and deliver various essential practices such as micro projects, basic experiments and group works for fostering basic social skills. The first 64 student group is referred as the group1 and the other is as the group2.

As a part of this course, we offered a practical exercise program of three weeks focused on developing basic social skills and promoting the use of several active learning methods. This program consists of three sequential different workshops. Each workshop is delivered in a similar manner based on active learning methods. The first workshop is called a micro

presentation, and the second workshop is a logical thinking practice and the third is a Jigsaw method workshop. Through these active learning practices, students are expected to learn gradually the following three major abilities in generic skills: the ability of expressing and explaining their own thought, the ability of settling arguments in a group discussion and leading to a proper conclusion, and the ability of communicating, contributing and collaborating in a group work. The program was designed in a way that students learn how to express their own thought first, then contribute in a discussion and eventually experience success in a group work.

***Micro presentation: the ability of expressing and explaining own thought***

This workshop is the introductory program of group works for the first year students. The time schedule of “Micro presentation” workshop is shown in Table 1.

Students are divided into small groups of 4 to 5 people. They start with ice-breaking time and then find a partner in the group and interview each other. The first presentation task is introducing the partner to another member in a group based on the interview result. Teachers act just as a time keeper or an observer during the first task.

After students become more relaxed and active, the lecture about Brainstorming method is delivered so that students are ready to understand one of technical methods for group work and acquire it as their knowledge.

The theme given after the lecture for a group work activity is “What is the good presentation?” and students discuss in a group by adopting the proper manner of Brainstorming. Each group presents the result of brainstorming in front of all participants at the end.

Students evaluate each other’s presentation and give a score on a five-point scale.

Table1. The time schedule of Micro presentation practice

Contents	Time	Feedback
Guidance and Icebreaking	30 min	
Pair work	30 min	
Presentation in a group	30 min	Evaluation sheets
Lecture about Brainstorming(BS)	15 min	
Group work (BS workshop)	50 min	
Presentation of the conclusion	30 min	Evaluation sheets
Briefing	20 min	Feedback sheets

***Logical thinking: the abilities of settling arguments in a group discussion and leading to a proper conclusion at the same time***

In this workshop, we adopted Logic tree method as a tool of critical thinking so that students can analyze the problem with certain depth of thought (Takeda, M. 2014). We present two ways to create a logic tree, one is “Why tree” and the other is “How tree”. Students approach the same given theme by creating two different types of trees so that they can look over the theme from different viewpoints and deepen their discussion on the theme.

Since the theme selected for a workshop is a good communication, the first target should be “why we can’t communicate well?” and then the second one should be “how we can communicate better”. Students are expected to create their logic trees after brainstorming in a group.

At the end of each session, each group presents their conclusion that the group has reached by applying the logic tree method in front of all participants. After the presentation of why trees teachers make feedback comments to students if necessary so that they can improve their analysis. Each student is supposed to make an assessment of each presentation.

The time schedule for “Logical thinking” workshop is shown in Table 2.

Table 2. The time schedule of Logical thinking practice

Contents	Time	Feedback
Guidance and lecture about Logic tree(LT)	25 min	
Group work (Why tree workshop)	50 min	
Presentation of the result	30 min	Evaluation sheets
Group work (How tree workshop) with LT	50 min	
Presentation of the result	30 min	Evaluation sheets
Briefing	20 min	Feedback sheets

### ***Jigsaw method: the ability of communicating, contributing and collaborating in a group***

This practice is offered based on Jigsaw classroom active learning method so that we can let everyone of a group be responsible and contribute to the group positively by assigning each student their own task. Students are presented various active learning methods which seem to be rather easy for beginners like the first year students to understand (Hall, S. 2002, Lestik, M. et. al. 2012, Kontio, J. 2013 & 2015). Because of such consideration, the four different methods like Formulate-share-create-revise, Mud cards, Recitation and Gallery walk were chosen in the workshop. Each student chooses one method that he/she wishes to be an expert of. Students form an expert group according to each method and discuss to deepen his/her understanding about the method. Then each student goes back to the original group for sharing their knowledge with others.

In order to confirm if students could share their knowledge with other members of the group successfully, a mini confirmation test was organized after the Jigsaw method workshop.

The afternoon session in the third period is supposed to be the compilation of all group works that had been done during three weeks; all groups discuss how they can deliver group works successfully and present their conclusions.

The time schedule of “Jigsaw method” class is shown in Table 3.

Table 3. The time schedule for Jigsaw Method practice

Contents	Time	Feedback
Guidance and lecture about Jigsaw method	35 min	
Group work (Learning an AL method)	30 min	
Group work (Sharing the AL knowledge)	40 min	Confirmation tests
Group work (BS workshop)	50 min	
Presentation of the conclusion	30 min	Evaluation sheets
Briefing	20 min	Feedback sheets

### ***Analysis of the feedback***

We gathered the feedback from students and teachers after each workshop. The feedback was made by scoring presentations delivered after each workshop, the mini confirmation test and the feedback sheets collected from students at the end of each day.

The scoring each presentation is made in four categories; delivery, attitudes during presentations, design of materials and contents of presentation. The figure 3 shows the average score of presentations evaluated on a five-point scale by all students. The first bar in the graph represents the average score of presentations of introducing a partner student in each group and the second bar is that of group presentations about “What is the good presentation” in the “Micro presentation” class.

It is interesting that each average score of all four categories for the group presentations is

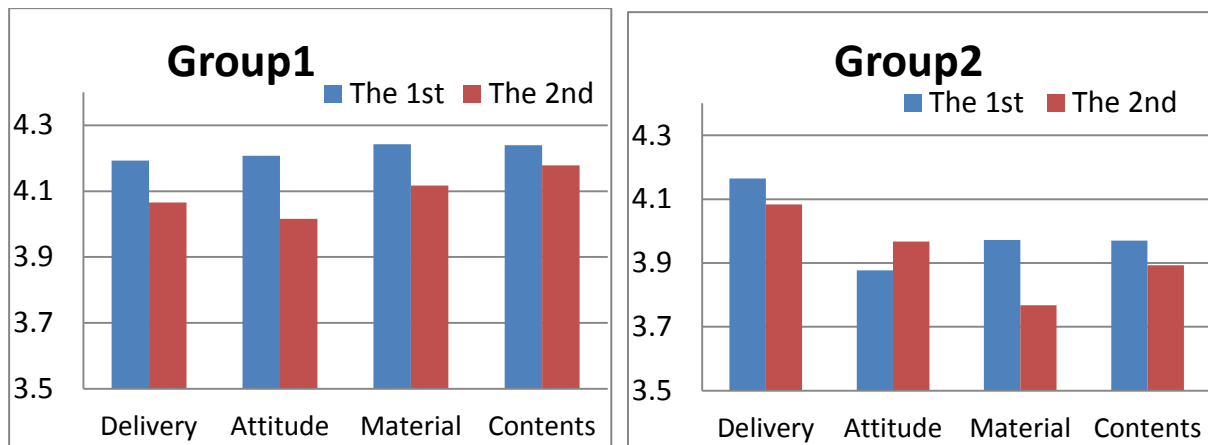


Figure 3. Average scores of the 1<sup>st</sup> presentations and the 2<sup>nd</sup> presentations in Micro presentation practice

lower than the first presentations in their own group for both of the first half (Group 1) and the second half (Group 2) of students. This result can be understood that students have learnt critical thinking after taking a lecture and discussing about a good presentation. In the workshop for logical thinking, students had to present twice about their conclusions. The figure 4 shows the average scores evaluated on a five-point scale as well. All categories

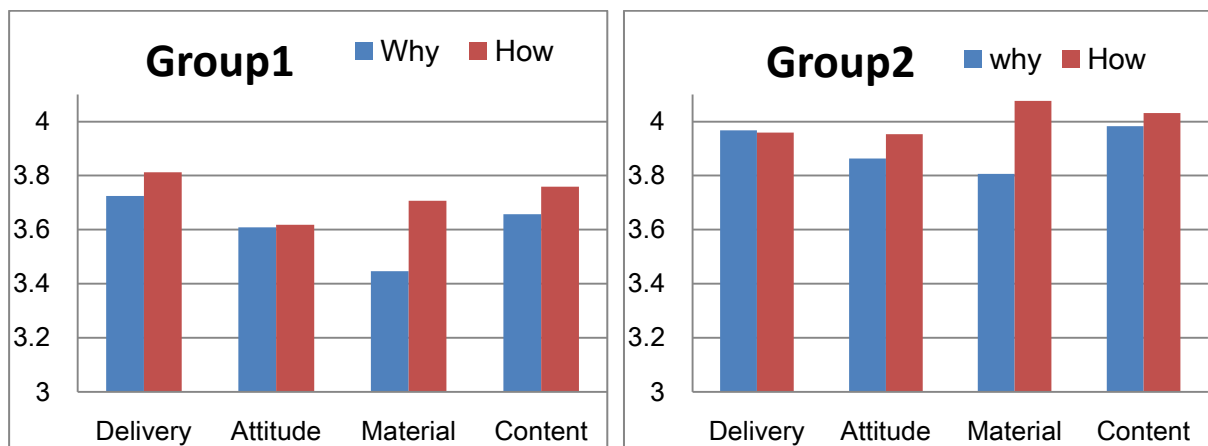


Figure 4. Average scores of the presentations for Why tree analysis and How tree analysis in the logical thinking practice.

of presentations for How tree analysis marked much higher than Why tree analysis. These results also can be understood to show that the logical thinking practices in the class helped students to analyze the problem better and explain their own thought well.

In the confirmation test done at the end of Jigsaw method practice, we asked all students to choose a proper method from four different Active learning methods which matches to each given explanation. Figure 5 shows the percentage of correct answers to the questions about three different methods. We can conclude from the graph that at least roughly 85% of students comprehended the basic meaning of each method.

The feedback sheet asked each student to rate their understanding levels of workshop contents and to answer three questions of what the target of each practice is, which kind of methods is applied in the practice and what the expected benefit obtained from the method is. A part of assessment for students is made by scoring answers for these three questions. The average score of 128 students evaluated based on the feedback sheets is 5 out of 15. It can be understood that students did not quite comprehend the meaning of the target of this program and the active learning methods introduced in workshops.

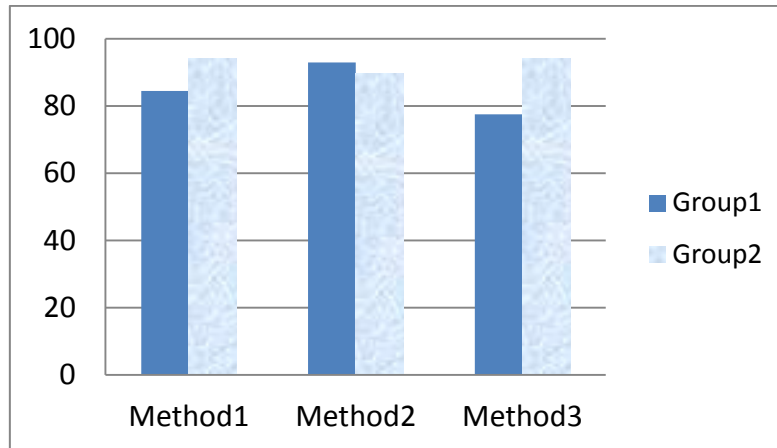


Figure 5. The percentage of students who did understand the three different Active Learning methods correctly after “Jigsaw method” practice.

## DISCUSSION AND CONCLUSION

We designed the introduction course of Active Learning methods for the first year students. The preparation of this new program was started a half year before the beginning of academic year 2015. The detailed discussion of which methods to adopt, how to introduce and what proper size of groups is and etc. were repeatedly discussed. The prime concerns were themes of group discussion and choices of AL methods which could induce a lively discussion among students and easy to deepen the argument maintaining certain interest. The feedback from the teachers suggested that Icebreaking worked well for relaxing the atmosphere in a group and Brainstorming helped students dragging out a lot of ideas and various thoughts on a theme.

The result shown in Figure 3 indicates that many students obtained a sense of critical thinking after the active discussion. Also Figure 4 showed that creating the two different logic trees helped students to analyze a problem better and deepen their understanding over the problem. We also could conclude from Figure 5 that the contribution to group work was made positively by assigning each student an individual task and students could communize their knowledge in own group successfully.

The average score of feed-back sheets collected from students was only about 5 points out of 15. We have to realize from this result and also from the feed-back comments from the teachers that many students did not understand about the correct meaning of the target of program and methods introduced and/or how to analyze problems with proper use of thinking methods like logic trees, for example.

Near the end of Academic year 2016, we picked one third of the first year students quasi-randomly and asked if those practices were helpful to their study thereafter. Figure 6 shows the questionnaire result collected from 40 students. The 70 % of them think Micro presentation and Logical thinking practices are effective and more than 50% answered they were able to contribute to group works more positively than before. We could acknowledge from these answers that there was certain effectiveness on the program.

The comparison between the PROG test results made at the end of the last academic year and this year is shown in Figure 7. The graph showed the average competency and literacy scores for all 1st year students in 2014 and these scores for all 1st year students in 2015. The competency in this year is higher than the last year result while the literacy in this year is lower than that in the last year. In order to draw any concrete conclusion, it is necessary to consider

the individual difference between two groups and also to follow up study of the same group of students. However, it might be possible to say that the A<sup>3</sup> learning system including this practical program for fostering generic skills is effective to improve the competency of students.

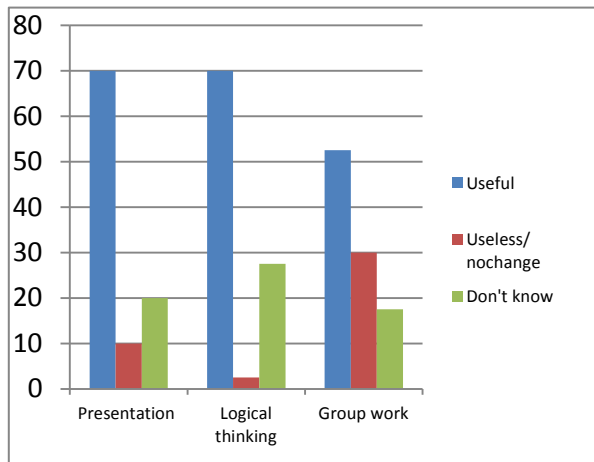


Figure 6. Percentage of answers for the question asking the effectiveness of each practice

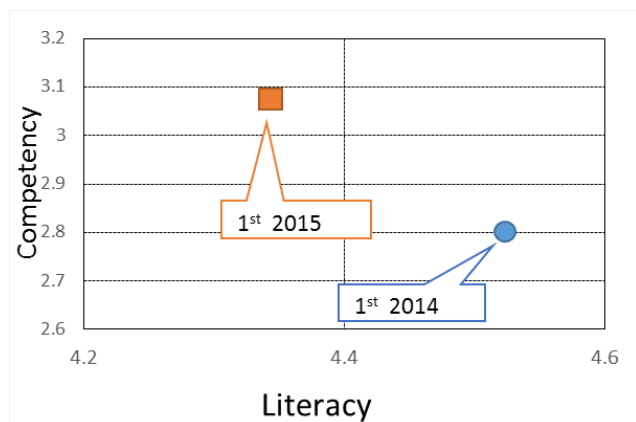


Figure 7. The result of PROG tests in 2014 and 2015 on 7-point scales

It is quite important what kind of themes we should provide to younger students. Active learning methods also should be more suitable to their study background so that they could actually apply them under own circumstance. We surely have to keep continuing this program for a few more years and also revising the contents based on feedbacks, and the most important thing is that we have to follow up these students for some more years.

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