

A Case Study of Problem-Based Learning and Action Learning at a University*

Kyungwon CHANG**

Kyonggi University

Korea

Many universities are searching for educational methods to cultivate problem-solving ability and cooperative learning ability or already trying to implement them. Problem Based Learning(PBL) and Action Learning(AL) are effective teaching and learning methods to cultivate men of talent qualified for problem-solving and cooperative learning abilities that universities are seeking after. PBL and AL have something in common in that learning is accomplished while learners are solving the authentic problem. But, in spite of this similarity, PBL and AL have differences. However, most literatures and cases on these two models introduce only the outline of commons and differences and do not provide teachers with actual helping aids to select a model appropriate for the actual design or operation of classes. Accordingly, many teachers usually select and utilize a familiar model rather than select a proper model to the nature of a subject and the educational goal. Teaching and learning methods or learning environment should be selected appropriately to the educational goal. This study indicates the characteristics of PBL and AL that are being introduced and utilized as a principal teaching and learning method of college education and then shows how this method can be realized in the university by comparing the cases of classes applied in two methods.

Keywords : Problem Based Learning, Action Learning, Authentic problem, Tutor, Learning Coach

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**College of Humanities, Kyonggi University, kyungwon@kgu.ac.kr

Introduction

In addition to the fundamental role of academic research, universities in recent has taken role of educating students from human resource perspective. With the practical demand grown, however the higher education seems to have not greatly changed yet, compared to the past (Song, 2004), and thus the quality of the higher education has turned out not to meet the corporate expectation. The cause can be found in that universities cannot sufficiently cultivate the ability needed in the actual enterprise area. Enterprises want graduates to be qualified for the capacity such as self-initiated learning ability, communication ability, creative thinking power, problem-solving ability, a sense of self-esteem, abilities of personal relations, negotiation and teamwork, organizational efficiency and leadership(Carnelvale, Gainer & Meltzer, 1990). Those abilities needed by enterprises are important abilities for the overall life in the knowledge-based society as well as for vocational functions(Hmelo & Evensen, 2000). Accordingly, cultivation of these abilities related to personal relations, communication and problem-solving should be one of the important educational goals.

In recent, many universities are searching for educational methods to improve problem-solving ability and collaborative learning ability or already trying to adopt various educational methods in accordance with the demand for change. Problem-based Learning(PBL) and Action Learning(AL), in particular, are paid full attention as important factors for the workshops for teaching faculty arranged by the Center for Teaching and Learning of each university(Chang, 2006). PBL and AL are effective teaching and learning methods to cultivate men of talent qualified for problem-solving and collaborative learning abilities that universities are seeking after. Previous researches have shown that individuals apply the problem-solving and cognitive skills they learned in PBL and AL when attempting to solve subsequent work problems of a highly ill structured or unfamiliar nature (Chang et al., 1995, Lohman, 2002).

PBL is defined as students in small teams exploring a problem solution and

through this exploration being expected to examine the gaps in their own knowledge and skills in order to resolve or manage the authentic situation with which they are presented (Barrows & Tamblyn, 1980; Savin-Baden, 2003). AL is a process or program in which learning is accomplished by a small group in the course of solving real problem that an enterprise faces and the whole organization and its members benefit from learning (Bong, 2006; O'Neil & Marsick, 2007).

PBL and AL have something in common in that learning is accomplished while learners are solving the authentic problems. But, in spite of this similarity, PBL and AL have differences, from their origins, school and enterprise, to problem-solving process, emphasizing point, nature of problem, etc. Experts in PBL have interested in and curiosity about AL and researchers or practitioners in AL have interested in and curiosity about PBL, too. However, most literatures and cases on these two models introduce only the outline of commons and differences and do not provide teachers with actual helping aids to select appropriate models for the actual design of his/her classes. Accordingly, many teachers usually select and utilize a familiar model rather than select a appropriate model to the nature of a subject and the educational goal. Teaching and learning methods or learning environment should be selected appropriately to the educational goal. This study reviews the characteristics of PBL and AL introduced and utilized as a principal teaching and learning method of higher education, and presents how this method can be implemented in a university by comparing the cases which applied in those two methods.

Theoretical background

Problem Based Learning³

Problem Based Learning (PBL) is a teaching & learning method that began as a result of reflection of the existing teaching and learning method in the medical

college. In PBL, learning is accomplished centering on practical problem (Barrows, 1985). PBL was developed as a teaching model for medical students in mid-1970s. Medical colleges all over the world are adopting this PBL method now and other areas, such as business administration, engineering and pedagogy, are adopting PBL for educating (Boud & Feletti, 1991).

The type and procedures of PBL can be different in accordance with the features of the institution, learning goals and subjects, but all the activities of PBL do not deviate from the basic procedures of PBL utilized in the early medical college. The basic process of PBL suggested by Barrows and Myers(1994) can be summarized into several steps, introductions & climate setting, bringing problem up students, problem confirmation and drawing learning tasks(issues), collecting data for problem-solving, problem re-confirmation and developing problem solution, presentation of solution, and arrangement of learning result and evaluation, as shown in Table 1. The teacher takes the initiative only in the steps of bringing the problem up students and arrangement of learning result and evaluation and learners are in the center of all the other steps. The teacher plays the role of a helper as a tutor (Chang, 2005).

It is important that the teacher plays the role of a tutor instead of the traditional role and learning is accomplished centering on learners in order for PBL to be successfully performed as shown in Table 1. That is, a teacher, in the early activities for introducing PBL, forms an atmosphere, in which learners can express their ideas and opinions, and guides the what PBL and PBL process. And then the teacher helps learners participate actively in the problem-solving process and learn more knowledge and skills related problem. In the early stage of PBL, a tutor cannot help mediating, however tutor's scaffolding is gradually decreased while learners are getting familiar with PBL mechanism. In the end of PBL process, it is an ideal state that the role of a tutor is needless. Diminished roles of tutor does not mean tutor's role is not needed at all. Accordingly, a tutor needs to fade out the degree of mediation but make learners recognize the tutor's existence (Barrows, 1988).

Table 1. PBL Process and Tutor Roles

Stage	PBL Process	Tutor Roles
Introduction	- Introduction & climate setting	- Introduction of an unfamiliar lecture method - Formation of permissive environment - Guidance of learners and tutor's roles
Problem - solving	- Bringing the problem up students - Problem confirmation & drawing learning tasks (issues) - Collecting data for problem-solving - Problem re-confirmation & developing problem solution	- Asking questions to promote learning - Diagnosis and mediation of educational difficulties of learners - Leading impartial participation of learners - Adjustment of the learning speed and level - Leading and adjusting personal relations in the group
Arrangement of learning contents	- Presentation of solution - Arrangement of learning result & evaluation	- Guidance of evaluation activity - Arrangement of learning contents

In order to implement successful PBL, development of good PBL problems is an important factor as well as facilitation. A well-designed PBL problem provides pleasant and valuable experience to the tutor and learners. But an ill-designed problem leads the tutor and learners to frustrating and exhausting experience (Barrows, 2000). After all, the characteristics and effect of PBL are determined by the problem. Duch(2001) suggested the characteristics of good PBL problems as follows: First, effective problem must first engage students' interest and motivate them to probe understanding of the concepts being introduced. It should relate the subject matter to the real world as much as possible. If the problem is placed in a context in which the students are familiar, they will feel that they have a stake in solving the problem. Second, problems that work well sometimes required students to make decisions or judgments based on facts, information, logic and/or rationalization. Third, problems should be complicated enough that cooperation

from all members of the student group will be necessary in order for them to effectively work toward a solution. The power of PBL lies in the ability of the group to synthesize what they have learned and connect that new knowledge to the frame of understanding that they are building, based on the concepts in the course. Fourth, the initial questions in the first stage of a problem should be open-ended, based on previously learned knowledge, and/or be controversial so that all students in the groups are initially drawn into a discussion of the topic. Fifth, the content objectives of the course should be incorporated into the problems, connecting previous knowledge to new concepts, and connecting new knowledge to concepts in other courses and/or disciplines.

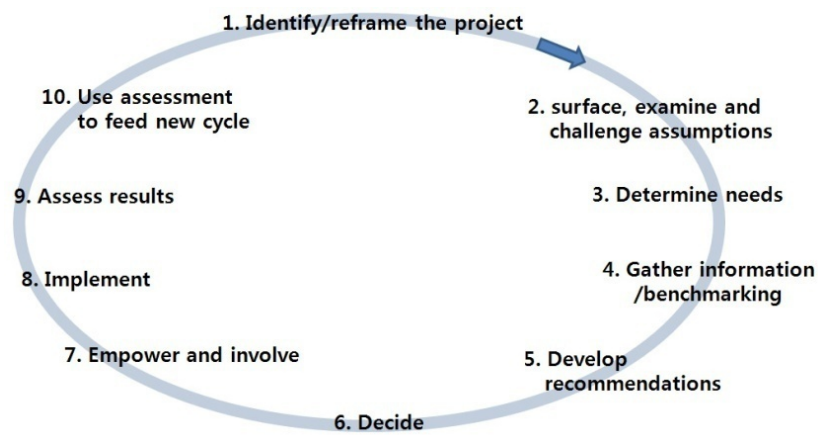
Action Learning

Action Learning (AL) is a process in which learning participants form a learning team, establish an actually existing task of the sponsor or a participant himself/herself to be surely solved as a whole team or individually, solve tasks or draw up a solution device together with a learning coach and learn the contents of task and the task solution course through acquisition of knowledge, asking questions, feedback and self-examination (Bong, 2006).

The components of AL should be sufficient so that AL can be successful. Marquardt(2000) suggested six main components of AL, such as the problem or issue, learning team, making a commitment to take action, focus on learning, learning coach, and questioning & reflection. The characteristics of each component are as follows: First, the problem or issue should be difficult to be surely solved in a department or in the whole company. It should not be an assumed problem, but a real problem directly related to the interest or survival of the organization. Second, when you compose a learning team of 4 to 8 people, consider the composition that participants with various points of views and experiences can be mixed into a team so creative access to task solution may be possible. At this point, it is needed to compose a team of members whose ability

levels are about the same in order that one or two persons are not allowed to take leads in the team activity and discussion and criticism can be freely performed (Marquardt, 2000). Third, in making a commitment to take action, one of the main characteristics of AL is the presupposition of ultimate and practical solution of the field problem having failure risk. Accordingly, problem solution requires practice, so execution will included in the main components of AL. Fourth, in the case of acquisition of knowledge related to the task and solution process. Knowledge is related to the contents of the task and the task solution process. Fifth, in questioning & reflection, what AL is compared to the other educational program is that learning is accomplished in the course of searching, asking and self-examining in order to find the essence of the problem and the effective problem-solving method instead of being initiated by the teacher. Sixth, learning coach is a person who promotes effectiveness of a learning team, takes a neutral attitude on the discussion theme and is not officially authorized to make a decision. He/she intervenes to help the learning team improve problem recognition method, problem-solving method and decision-making method.

AL process shows the characteristics of action research to collect, analyze and apply the field data(see Figure 1).



[Figure 1] Action Learning Process

As you see in the Action Learning Process, AL does not limit any specific problem-solving process or tool. This can be interpreted as an open problem-solving method. From a different point of view, it suggests that the role of a learning coach is very important to secure desirable progress of AL. A learning coach should provide the learning team with a problem-solving tool appropriate for the nature of the problem. Apart from provision of this problem-solving tool, various roles are required of the learning coach. ON'eil & Marsick(2005) suggested as shown in Table 2.

Table 2. Learning Coach Roles and Responsibilities

Roles	Contents
Team Intervener	<ul style="list-style-type: none"> • Ask questions as the favored approach for interventions • Help participants learn to ask the right questions • Help the team balance task and learning • Help the team deal with emotions generated by balancing task and learning • Make the work of the team visible • Challenge the team • Enable learning • Create a supportive environment • Help rather than teach • Create ways to think differently • Say nothing ; be invisible • Hold back on interventions • Allow problem in team to continue so learning can occur
Team Reflector	<ul style="list-style-type: none"> • Help the team reflect on its process and process in solving their project • Help the team to learn how to reflect to diagnose team problems • Use reflection as an integral part of the intervention work • Do at specific set times • Use when the team is stuck or heading into difficulty • Reflection is prompted by the use of questions

Team	<ul style="list-style-type: none"> • Use the just-in-time learning philosophy and requests for help from the team to determine appropriate times to offer training and/or development
Periodic/ Coach	<ul style="list-style-type: none"> • Share the role with team members • Help the team learn how to transfer learning from the program back to the job • Help the team to learn how to learn from work • Work with the team to transfer learning coach skills • Help participants to give and receive help and feedback to each other

Sponsor Liaison and Coach	<ul style="list-style-type: none"> • Establish an agreement with the team's sponsor that includes how they will work together to support the team and a schedule for communication during the program to help ensure sponsor involvement and comfort with his/her role • Contact with sponsor for appropriate coaching role with the sponsor for program • Work with sponsor to help create understanding of balance between work and learning required in team and how to reinforce that balance • Help the sponsor to have his/her assumptions and ideas of the right solution questioned and challenged, so the wrong message isn't sent to the team
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Similarities and Differences

PBL and AL have the following important common points as learner-centered teaching and learning environment compared to traditional teaching and learning method. First, both PBL and AL have recognition that meaningful learning can be accomplished through learners' direct experience. Second, in PBL and AL, learning is accomplished through practical problem-solving. Third, in PBL and AL, learners should collect, analyze and synthesize data needed in solving the problem self-initiatively. Fourth, the teacher, tutor in PBL or learning coach in AL, plays the role as a helper of learning, not as a contents messenger. Fifth, PBL and AL emphasize collaboration with team members and improvement of problem-solving ability through discussion performed in collaboration. Sixth, PBL and AL emphasize

reflection on the learning process and the result. PBL and AL are more likely to result in double-loop learning. In PBL and AL, students are responsible for framing problems, selecting and accessing learning resources to gather information, and generating and testing hypotheses about problem causes and solutions. These activities promote double-loop learning by involving students in the critical examination of a problem's underlying assumptions, procedures, and goals (Argyris, 1980; Raelin, 2000). PBL and AL have many common points as shown above, so these two models are recognized as the same. However, PBL and AL have distinctive differences as follows:

Table 3. Comparison of PBL and AL

	Problem Based Learning	Action Learning
Origins and Historical	Formed as a model to develop experts in the medical college.	Formed as a model to solve problems in an organization of an enterprise.
Problem (Task)	Ill-structured problem None information provided Actual or none-real situation to achieve the learning goal composed by the tutor.	Ill-structured problem None information provided Authentic problem on organization
Process	Based on the clinical reasoning process of the doctors. Suggests a peculiar process to access the problem.	Based on Action Research. Not limited to the access process to the problem.
Focus of Implementing	Developing individual skills and contents learning are important More intention to learning than solving problem	High impacts on organization Equal demands if individual and organization Same intention to solving problem than learning
Outcomes	Double-loop learning Near and far transfer of content knowledge & skill Ability to solve ill-structured problems	Double-loop learning Far transfer of content knowledge & skill Ability to solve ill-structured problems Address a high-impact organizational problem

The differences lying between PBL and AL are as shown in Table 3. First, PBL and AL were originated from different contexts, medical college and enterprise. PBL places an emphasis on education and AL on problem-solution when implementing the program. Second, PBL is aimed at learning, so possible complicated (actual or none-real) situations are suggested so that learners can learn the learning contents intended by the teacher. AL is aimed at problem-solution, so an actual problem to be solved. For this reason, PBL places the focus on learning, rather than problem-solution and AL places the focus on problem-solution, rather than learning. Third, PBL suggests a specific problem-solving process and AL does not specify any problem-solving process. The PBL process was developed on the basis of doctors' clinical reasoning process and suggests that getting familiar with this process can improve problem-solving ability as a professional. But, AL is to collect, analyze and synthesize the data of the field, so it does not suggest any specific process and allows to select and utilize a proper process. So, learning coach might provide the team with planning tools in advance to do their work. But in many AL designs, a key general principal, which also guide how the learning coach works with team, is to allow people to learn from their own mistakes and difficulties (O'Neil & Marsick, 2007). Fourth, PBL is aimed at increasing the ability to understand the contents related to the problem situation and solve the problem, whereas AL is aimed at problem-solving of an organization and improving problem-solving ability. Fifth, in PBL, a problem solution plan may or may not be applied to the actual context. But, in AL, a problem solution plan is applied to the actual field, so it is very important how useful the result is.

PBL and AL have these common points and differences, so in order to design and implement PBL or AL class; teacher should be different when applying the two models to the college classes. First, in PBL, a teacher develop problems, but, in AL, problems of the field related to learning contents should be picked out and the sponsor should be connected to students. Second, in PBL, the teacher provide the PBL process, but, in AL, a problem-solving tool should be suggested in accordance with the nature of a problem. This study shows how these differences come out concretely in the actual classes.

Study method and result

A qualitative case study was performed on two classes, a PBL type class and AL type class, in order to bring about the differences between these two classes. The object of the qualitative case study was two pre-service teacher training courses, "Teaching method & education technology" in the A university located in the metropolitan area. These two courses were designed and managed in PBL and AL.

1. Contents and Syllabus in the types of PBL and AL

The classes proceeded in the types of PBL and AL were designed and implemented by the same teacher. Description and objectives of two classes were the same as shown below:

◎ Course descriptions: 'Teaching method & educational technology' explores "What is good teaching?". This course introduces the field of educational technology and the theory and practice of instructional design. Especially this is designed based on "PBL(Problem based learning)/AL(Action learning). You will experience on authentic teaching environment as a teacher, instructional designer, and e-learning designer. Upon completion of this course, course objectives are the following as ; 1) explain characteristics of educational technology, 2) understand 'behaviorism', 'cognitivism', and 'constructivism' and utilize them to design instruction, 3) design e-Learning and future learning environments, 4) behave desirable teacher's lesson activities, 5) solve problems related to teaching, and 6) acquire collaborative skills. Two classes have the same objectives, but were operated in different methods, in PBL and AL. In PBL class, the teacher describes PBL to the students as shown in Table 4. and let them solve three problems in a semester after making the students get familiar with PBL. In AL class, students solve one task in a semester as shown in Table 5. Presentations are performed three times in the process of task solution by learning teams and the main contents to be learned in this subject are presented by the students. Especially, the learning team in charge prepares the learning contents for the presentation together with the teacher.

Table 4. Problem Based Learning Implementation Plan

	Contents & Activities	Assignments
1	· Course Orientation & Ice-breaking	
2	· Practice of PBL Process (Introduction of PBL, PBL Process, Exercises) · Organizing into groups & team building activities	
3	· Problem 1 : What is 'educational technology'?	Study plan 1
4	· Team Work: Reason through the problem 1	
5	· Presentation of the conclusion of Problem 1 · Mini lecture (Characteristics of educational technology)	Solution of Problem 1 Reflective Journal 1
6	· Problem 2: Comprehension of basic theory of educational technology (behaviorism, cognitivism, & constructivism) and instructional design	Study plan 2
7	· Team Work: Reason through the problem 2-1	
8	· Team Work: Reason through the problem 2-2	
9	· Presentation of the conclusion of Problem 2 · Mini lecture (How to teach?)	Solution of Problem 2 Reflective Journal 2
10	· Lecture : Instructional Systemic Design & Instructional Design Models	
11	· Problem 3 : Comprehension and application of e-Learning, Design e-Learning	Study plan 3
12	· Team Work : Reasoning through the problem 3	
13	· Presentation of the conclusion of Problem 3 · Mini lecture (Effective design and managerial strategies e-Learning)	Solution of Problem 3 Reflective Journal 3
14	· Lecture & Case Study: Desirable teaching attitude & method	
15	· Lecture & Case Study: Evaluation of educational programs · Wrap up lecture: Trends & issues in educational technology	
16	· Final exam (Final exam questions are similar to PBL problem form.)	

Table 5. Action Learning Implementation Plan

	Contents & Activities	Assignments
1	· Course Orientation & Ice-breaking	
2	· Organizing into groups & team building activities · Lecture : What is educational technology?	
3	· Workshop for team based learning activities · Allocating clients to each team (Teacher supply only phone number of client)	Task specifications
4	· Student Presentation & make up lecture : ISD- Analysis	
5	· Student Presentation & make up lecture : ISD- Design	
6	· Team Work for preparing presentation 1 round	Preparing Presentation 1 Reflective Journal 1
7	· Student Presentation 1 round (Analysis part)	
8	· Midterm examination	
9	· Student Presentation & make up lecture : ISD- Development	
10	· Student Presentation & make up lecture : ISD-Implementation	
11	· Team Work for preparing presentation 2 round	Preparing Presentation 2 Reflective Journal 2
12	· Student Presentation 2 round (Design & Development parts)	
13	· Student Presentation & make up lecture : ISD- Evaluation	
14	· Student Presentation 3 round (Final solution)	Preparing Presentation 3 Reflective Journal 3
15	· Making a Concept map (team activity) · Make up lecture	Final solution paper Concept map
16	· Final exam (Final exam questions are similar to AL task form)	

Design strategies on PBL and AL

Table 6. shows the things to be considered when designing the PBL type class and the AL type class suggested by the teacher in charge of two classes: Problem development, course management, roles of the teacher and learners and evaluation method.

Table 6. Design strategies on PBL and AL

	Problem Based Learning	Action Learning
Problem development	<ul style="list-style-type: none"> . Selecting main contents to be learned in the 'Teaching method & education technology' courses and searching for the actual and contextual situation to be solved only after understanding these contents. . Searching for the situation and developing three problems. . Adjusting the degree of difficulty so each problem can be solved about in three weeks. 	<ul style="list-style-type: none"> . Searching for actually possible situation out of the problem situations to be solved only after finding out and understanding these contents to be learned in the 'Teaching method & education technology' courses. . It is desirable to bring up 'class consulting' to improve the actual class as the result of situation searching as a problem situation. Then find out a professor who needs 'class consulting' and designate him/her as the sponsor. . Connect the professor, who needs 'class consulting', designated as the sponsor with the learning team
Course management	<ul style="list-style-type: none"> . Providing the students with the opportunities to practice the PBL course so the students can get familiar with the PBL course. . Solving three problems. . Lecture on the contents not included in the three problems. 	<ul style="list-style-type: none"> . It is important to learn voluntarily and cooperate with the team members. Provide the learners with opportunities for team learning skills and practice. . Solving one problem. . Presentation on five themes (analysis, design, development,

		execution and evaluation) and supplementary explanation by the teacher.
Role of teacher	<ul style="list-style-type: none"> . Facilitator and questioner . (After presentation of problem solution) . Arranger of contents 	<ul style="list-style-type: none"> . Facilitator and questioner . (After presentation of problem solution) . Arranger of contents
Role of learners	<ul style="list-style-type: none"> . Problem solver 	<ul style="list-style-type: none"> . Problem solver
Evaluation	<ul style="list-style-type: none"> . Solution of three problems . Degree of team activity . Reflective journal (three times) . Term exam 	<ul style="list-style-type: none"> . Solution of task . Degree of team activity . Reflective journal (three times) . Term exam

After analyzing and arranging the contents to be significantly learned in the PBL type class, the teacher developed three problems that can be solved only after learning the contents as shown in <Table 4>. The teacher tried to find out actual cases to which the contents to be significantly learned in the AL type class can be applied. Five professors who voluntarily needs improvement of class were selected as sponsors. To solve the problems that the sponsors want to be solved, the class was operated in a way that students solve the problems.

3. Problems used in PBL and AL classes

Table 7. shows the problems used in PBL and AL classes. The PBL problems were developed by the teacher in charge and the AL problems were real problem in front of the professors who want to improve class. The problems of PBL are the 'scenario' drawn up by the teacher and are suggested in a document form of a situation as shown in 'problem1' of <Table 7>. The problems of AL are the contents of task description drawn up by materializing the problems to be solved through interviews with the sponsors.

Table 7. Problems used in PBL and AL classes

Div.	Problems
PBL	<p>. Problem 1 : How can I utilize the contents of 'Cyber Home Learning'? (full contents)</p> <p>You, a research teacher in charge of G Middle School(Yeongsoo Kim), are a teacher in agony with the idea of "How can I teach better?" You ask your fellow teacher if he utilizes 'Cyber Home Learning' in class while you are reading an article about 'Cyber Home Learning' recently. Your fellow teacher said 'Yes' and added that but, there is no idea to utilize the contents efficiently and effectively, so he just suggest the data to the students or gives the students homework.</p> <p>After you heard your fellow teacher's answer, you thought you would suggest a device to utilize 'Danopi' Cyber Home Learning, a Gyeonggido cyber home learning, in class in the inside-school 'Teaching Method Research Seminar' to be held in two weeks. And you thought the important thing is to suggest standards for selecting and utilizing the contents and functions provided by the cyber home learning, not to give simple utilization device.</p> <p>Teacher Kim... Prepare PPT data of the contents to be presented in the 'Teaching Method Research Seminar'. Let your fellow teachers know how to utilize the data for better classes on this occasion.</p>
	<p>. Problem 2 : Prepare a research class. (abstract)</p> <p>The host, a student teacher in apprentice, suggests a lesson plan of a unit of social studies or mathematics designed in 'Teacher-centered Instruction' and 'Learner-centered Instruction' types.</p>
	<p>. Problem 3 : Developing 'Contents of cyber home learning : Through m-learning !!!' (abstract)</p> <p>The host, a high school teacher participating in the cyber-home learning project, draws up a development plan and a sample storyboard of contents of cyber-home learning can be operated in m-learning.</p>
	<p>. In 'Life and Law' class with 80 members of class, students cut the class in half of the class(three hours total). What can I do so students concentrate on the class without cutting class?</p>
AL	<p>. In 'Introduction to Psychology' class, When I ask questions, no students answer. What can I do so students answer the questions better?</p>
	<p>. An English class in an elementary school is very short, just 40 minutes. What can I do to give feedbacks of learning activity to the students efficiently and effectively?</p>

. E-learning contents of 'Educational history & philosophy', depending only on lectures, should be developed. I have no experience to develop e-learning contents. What do I have to prepare? How can I teach in cyber space?

. In order to help students think logically, I want to use a spring note, instead of the existing on-line community in my class. Students show rejection response. What can I do?

The problems used in two types of classes are different in terms of supplying them to students. There are other differences as follow: First, three problems are solved in PBL and one problem is solved in AL. The teacher gave the following opinion about that “In PBL, it is important that students get familiar with the PBL process. A preceding study (Chang, 2006) shows that students feel it difficult to solve the first problem because students are not familiar with the PBL process. However, when solving the second problem, the speed and result of problem-solving improves because students get familiar with the process. It is useful to utilize various contents in order to include all the contents to be learned, I supplied three problems with different contexts. But, in AL, it is needed to collect, analyze and synthesize the data of the field. If you make students solve a problem in three weeks as in PBL, students can only do a shallow level of problem-solving activity. Accordingly, in AL, it is thought proper that one problem can be solved in a semester.” Second, in PBL, all the students solve the same problems, but, in AL, each team solve a different problem. The teacher gives the following opinion about this. “So, in the case of AL, I tried to find out sponsors with various problems. It is also important to learn the solving process and solutions treated by other teams. It can be a good opportunity to compare its own team's solutions with other team's solutions because the same problems are solved in PBL. According to PBL experience in the previous semester, students may not concentrate on the class. Accordingly, all other students can participate in the other team's presentation as evaluators. The same is in AL.”

Opinions of teacher and learners on PBL and AL classes

The teaching portfolio written by the teacher and the reflective journals by the students were collected and analyzed in order to grasp the opinions of the teacher and the learners on PBL and AL classes. Main opinions suggested by the teacher and the learners on PBL and AL classes are as follows:

Table 8. Opinions of the teacher and the learners on PBL and AL classes

	Problem Based Learning	Action Learning
Teachers	<ul style="list-style-type: none"> ▪ The most appropriate problems can be suggested to the students because the teacher develops problems in person. ▪ Students get familiar with the problem-solving process while solving three problems. The approaching and problem-solving process gets very proficient in the third problem compared to the first problem. 	<ul style="list-style-type: none"> ▪ It is difficult to find out sponsors who suggest problems to the students. However, Students feel interested while meeting sponsors to solve problems because they contacted with human. ▪ I wanted to let students know a method to approach the problem, but, in AL, special method is not suggested. I had no idea what to do. I thought I performed a project, instead of practicing AL as a new learning model.
Students	<ul style="list-style-type: none"> ▪ It is good to think problems in various situations because the situations of the three problems are all different. But, so this class was difficult and much time was needed. ▪ Familiar with the PBL process, we can arrange 'ideas' first, when given a task. 	<ul style="list-style-type: none"> ▪ We participates in the class earnestly with curiosity that we give our professors consultation. ▪ The team learning skill learned in class was helpful in doing another team meeting of other classes. ▪ It was more interesting than the PBL class in the previous semester. But we learned more contents from the PBL.

The teacher suggested the following opinions, too. “I think both PBL and AL are good ways to achieve the teaching objectives of this subject. Especially, it was very good to cultivate the ‘ability to solve problems related to teaching and acquire collaborative skills’. But, the difficulties in designing and operating two classes are different from what said above. That is, in PBL, problem situations can be developed properly to the contents to be taught, so the teacher has advantage of control over the situation. It can be also a load. On the contrary, in AL, it is difficult to find out proper sponsors. A certain professors, who operate an AL type class, lets students determine sponsors. It can be a good way, but I think it is a good way to find out sponsors, who can provide students with situations containing the contents to be taught in class because an AL type class is also a class. But it may be difficult to find out sponsors in accordance with majors and courses. In that case, it can be a good strategy to suggest a problem situation like in PBL. In distinction from PBL, Any other process can be permitted to use in AL.”

The students who have experienced both PBL and AL type classes suggested the following opinion. “PBL is more effective in order to know a problem-solving process through and through. Repeating the same process three to four times makes students get familiar with the problem solving process. But AL was more interesting. It was memorable event to see an actual (not none-real) situation, find a solution to the problem and make mistakes in the process. So, also in PBL, I think, it will be more interesting to give a problem situation to interview and observe. Both classes were good. We only listen to the lecture in other classes. However, in PBL and AL, we participated in class more actively, talking much and looking for data in person.”

The differences between PBL type and AL type classes can be summarized in two ways. First, the problem to be solved by students is an actual problem or a none-real problem that gives students actual context. Second, whether it gives students a process to approach and solve the problem or not. Accordingly, the teacher to design and operate class can select possible teaching method to be

actually operated, considering his/her own capacity and the characteristics of the course. The important thing is that both the classes can help learners acquire knowledge, problem-solving ability and collaborative learning ability, and cultivate a confident attitude.

Discussion and conclusion

It was discussed how class can be designed and implemented in PBL and AL at the university through comparing PBL type and AL type classes. Two classes have the same educational objectives, but were operated in two different methods. In PBL, the teacher developed and suggested several problem situations to be solved by the students. The students were made to approach and solve the problems according to the PBL process. In AL, the teacher searched for actual problem situations to be solved by the students and find out sponsors. The teacher taught the students team learning skills to help the students perform team activities more effectively and smoothly. The students were not made to solve the problems according to any problem-solving process.

The students in the PBL class became familiar with the problem-solving process while solving several problems and they were satisfied with the fact that they learned the contents through and through. The students in the AL class felt delightful at the actual field and they thought acquisition of team learning skills are the main learning outcome. The common opinion of the students who participated in both the classes was that they participated in the classes more actively than other classes, talking much and looking for data in person.

In PBL, the teacher has a load of problem development and in AL the importance and difficulty of arrangement of proper sponsors. For both class models, it is important to develop proper problems. In PBL, there is a specified process, but, in AL, there is no specified process. So the teacher provides the

student with a proper problem-solving process.

In many cases, PBL and AL are thought to have more common points than differences because the knowledge and problem-solving skills can be acquired in both models while solving the actual problems. But, the origins of the two models are school and enterprise each. Many considerations need to be taken into when applying these two models to different contexts. That is, PBL emphasizes learning. Students have to acquire learning contents while solving problems in the actual context. On the other hand, AL stresses the output of 'problem-solving' rather than learning. In this study, AL is applied to the school class; it is difficult to find out sponsors with real field problems. When AL is operated in an enterprise, many sponsors can be found in various departments and positions. On the contrary to this, when PBL is utilized in corporate context, an emphasis is placed on problem-solving of the field rather than learning. This may cause conflict.

Since many enterprises adopt AL as a method to cultivate organization development and human resources development, AL can be utilized as a teaching method at the university in order to establish a strategy to produce competent graduates. PBL having the same education effect as AL can be utilized in many major courses for college of law, business administration, education as well as medical college. However, Teacher need capacity of securing proper sponsors, facilitating learners, and selecting proper problem-solving tools in order to succeed in AL. Teacher have ability of problem development and facilitation to help learners in order to succeed in PBL. Accordingly, the important thing is not 'to select one of the two teaching programs, PBL and AL', or 'to decide which program is more suitable to his/her class', but 'what capacity should be needed?' or 'what can be prepared?'

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Kyungwon CHANG

Assistant Professor, College of Humanities, Kyonggi University. Interests: Problem based Learning, Constructivism, and Faculty Education in Higher Education

E-mail : kyungwon@kgu.ac.kr

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