
Effect of PBL applied On-line Debating System.

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웹기반 문제중심학습(PBL) 시스템을 적용한

사이버 토론 학습 프로그램의 효과

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ABSTRACT

This research examines how e-PBL system affects 'self-directed learning ability' by applying it to "Science Cyber Conference" participants for 16 weeks. Participants' perception of PBL class process was also looked. After applying PBL program, participants' 'self-directed learning ability' has effectively changed statistically($p<.05$). Especially, it showed significant change in 6 areas of 'self-directed learning ability' out of 7. Participants also showed positive response to PBL program ($p<.05$).

요 약

본 연구는 K대학부설과학영재교육원 학생 중 웹기반 사이버 토론 학습 프로그램인 "Science Cyber Conference" 참가자를 대상으로 문제중심학습(Problem-based Learning; PBL) 전략을 적용한 시스템을 개발하여 16 주 동안 프로그램을 진행한 후, PBL 전략이 '자기주도 학습 능력'에 미치는 영향에 대해 알아보았다. 이와 더불어 PBL 수업 과정에 대한 학습자의 인식을 조사하였다. 웹기반 PBL 전략을 적용한 프로그램 진행 후 학습자의 '자기주도 학습 능력'이 통계적으로 유의미하게($p<.05$) 효과가 있었다. 특히 '자기주도 학습능력'은 7개의 하위 영역 중 '학습자 신념'을 제외한 6개의 영역에서 유의미한 차이를 보였다($p<.05$) 또한 웹기반 PBL 전략을 사용한 수업이 긍정적이라는 인식을 보였다.

keyword

PBL, gifted education, e-PBL, Problem Based Learning

I . Introduction

1. Necessity and aim of the study

Aim of the education for science gifted students is for students to improve problem finding and solving skill along with capability of self learning, and to have positive attitude towards science.[1],[2]

Wheatley(1989) emphasises PBL so gifted students can finish their assignments by themselves along with their ability to concentrate on one thing.[5]

PBL is a student-centred leaning program

which induces learning by solving unstructured real life problems. PBL, which first started in medical school, has proved its effectiveness in educational field, and has been applied in variety of educational spots.[4]

Also, by applying advanced IT, web based PBL program is increasingly developing. In several studies, the Web environment for web-based PBL to increase the participation of the learner, through social interaction facilitate the empirical knowledge construction activities, that is empirically meaningful learning activities and the results have demonstrated that induction.[6]

The results of the above studies, how can web-based PBL system improve the learners self-directed learning in gifted education. This study explores the research issues are as follows:

- Does the e-PBL system enhance the skills of self-directed learning?
- Does the learners have positive recognition for e-PBL system learners?

2. Related studies

1) Factors of self-directed study

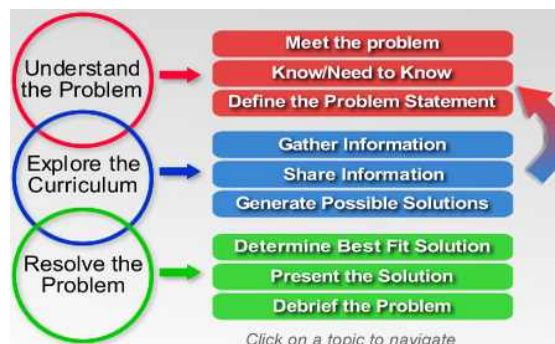
Learning is change of cognitive, definition, behavioural experience, so self-directed learning means these are done by students themselves. Thus, students set their own aim, along with motivation, recognition, action, and evaluate the results while improving their creativity and problem solving skills. To understand self-directed learning, it is important to know the factors of it. Hence, self-directed learning can be composed with followings.

- **Inner power** which encourage students to learn. Motivation can be given by other people but it is more powerful and lasts longer when students finds a motivation themselves. This motivation is directly related to goal orientation.

- **Practical strategy** used for students to remember and understand data or information. It is also a reason why two students learn different amount of same thing under same time. Demonstration, elaboration, systemisation, plan, examination, evaluation are some factors of strategy.

- **Behaviour management** in self-directed learning means, to be able to promote appropriate learning environment and follow. It relates to students being able to manage their behaviour and time, and ask for help when needed.

2) Problem-Based Learning Model



It is IMSA model¹⁾ of PBL teaching and learning model that widely used. IMSA model is composed with 'problem understanding', 'problem exploring' and 'problem solving'. Delisle(1997) model; derived from medical school's Barros(1994) model, is also widely used. This model is composed with five process; lesson development, problem introduction, follow-up stage of problem, submission and presentation of results, conclusion and solution of problem. Other than above, LinEhe Kang(1998) model, JungHoon Lee(2003) model exist. This study applied community based PBL procedure as table below.

Steps	Details
Prior activities	- Learning preparation - configuration teams
Problem presented	- Problem identification - Set goals - Recognize the roles
Planning problem-solving	- Solve planning - Individual roles
Individual self-directed learning	- Individual Learning Plans - Individual resource navigation - organize the individual learning
Cooperative learning and problem-solving	- Teams discussed. - problem-solving
Summary of the announcement	- organize the results. - The results announced - Result of feedback
Reflection and Evaluation	- Assessment of Self-learning skills - Assessment of cooperative learning

3) e-PBL

e-PBL can subject educational effects such as diversity of learning environment, invigoration of interaction of learning resources and expansion of communication.[7]

1) <http://pbln.imsa.edu/model/template>

II. Research methods and procedures

1. The subjects of this study

It was applied to 6th to 8th grade students who participated in Science Cyber Conference from Institute of Science gifted education. Science Cyber Conference was hosted for 16 weeks, providing real life problems to all student age group.

2. Research Tools.

Self-directed learning ability test paper and survey paper on e-PBL perception were used in this study.

1) Test paper for Self-directed learning ability

The test used in this study; self-directed learning inventory for teachers, which is originated from Guglielmino's self-directed learning readiness scale, was translated and modified by Kijah Kim. for Korean system. It contains 40 questions, 7 sections. Each section was marked with Likert criteria and the results are like following.

Cronbach's α	N
.915	30

2) e-PBL survey

The survey used in this study was derived from 정형미's e-PBL perception survey. Original 10 questions were restructured suitably to 19 questions. Each section was marked with Likert criteria. Credibility of sections is like following.

Cronbach's α	N
.895	19

3. Research procedures

This study was processed with 'one group pretest-posttest design.

first, students' self-directed learning ability test was performed.

second, The Science Cyber Conference was held since the 1st of June for 16 weeks with the topic "Impact of the Fukushima nuclear disaster to us". Progress assignments were given each week in order to guide the topic. Assignments were based on e-PBL model.

third, after the conference was finished, the test and survey were done for analysis.

4. Analysis

After PBL lab classes, Single-group t-test was performed to see the changes in 'self-directed learning ability'. The results are shown in (table. 4) and 'self-directed learning ability' has

been improved from 144.6 to 151.8. In detailed section, apart from 'self-confidence as a learner', it showed significant improvement in 'love of learning', 'proactive planning', 'creative approach', 'future orientation', 'acceptance of responsibility for learning', 'inquisitive nature'. This proves that PBL is able to encourage students to learn and improve.

In management of motive's factors, apart from 'self-confidence as a learner', 'love of learning' and 'proactive planning' have been positively improved. This is a result of students' active participation and proactive planning. And In management of Cognitive's factors, 'creative approach' and 'future orientation' showed positive improvement. Students are allowed to approach problems from various angles. By being able to have realistic approach to Fukushima nuclear accident, students realise that they are not just bystanders, and it can also happen to them. Which helped them to see the problem from different angles for solution.

table 5. result of Self-directed learning ability

Division		Pre-test		Post-test		t	p
		M	SD	M	SD		
manag ement of Motive	self-confide nce as a learner	23.3	2.3	24.8	2.7	1.332	.252
	love of learning	24.1	3.1	26.1	3.1	2.362	.026*
	proactive planning	21.2	2.5	22.8	2.8	2.736	.007*
	sub total	68.7	7.7	74.4	8.3	3.554	.003*
manag ement of Cogniti ve	creative approach	28.9	3.7	32.7	4.1	2.562	.026*
	future orientation	17.2	1.8	18.7	1.6	2.783	.010*
	sub total	46.1	5.4	50.1	5.3	3.323	.004*
manag ement of Behavi or	inquisitive nature	12.6	1.7	14.3	1.9	2.251	.044*
	acceptance of responsibility for learning	10.1	1.7	12.3	1.5	10.28	.000*
	sub total	22.4	3.2	27.2	2.6	8.712	.000*
total		144.6	12.2	151.8	14.1	4.323	.000*

*p<.05

In management of Behavior's factors, 'acceptance of responsibility for learning' and 'inquisitive nature' showed positive improvement. In order to solve PBL problems, it is necessary to build up hypothesis, think creatively to solve problems, and logically predict the outcome. Also, to verify the hypothesis, structuring and executing experiments, and analysing the outcome is

needed, which improves students' 'inquisitive nature'.

Students showed positive response to PBL experiments, in 'Reality of problems', 'adequacy of problems', 'Use of resources', 'Self-directed learning', 'Attitudes toward science', 'Satisfaction for the class'. In overall, positive response was over 70%, even with online classes; 'Attitudes toward science', 'Satisfaction for the class'. But 'Use of resources' and 'Self-directed learning' had relatively underappreciated, and this is because young participants were having problems with structured approach of data collection and interpretation.

details	question	Response(%) ^a					M	SD
		1	2	3	4	5		
Reality of problems	Q01	0	0	23.1	65.9	11	7.1	1.3
	Q02	0	3.8	29	58.5	8.7		
	Q03	0	10	30.1	57.6	2.3		
adequacy of problems	Q04	0	3	17.1	71.1	8.8	6.9	1.1
	Q05 ^b	8.7	5	42	34.1	10.2		
	Q06	0	2	8.4	81.8	7.8		
Use of resources	Q07	0	7.1	33.2	33.6	26.1	8.3	1.2
	Q08	0	8.2	20.1	41.7	30		
	Q09 ^b	0	4.2	46	41.93	7.87		
Self-directed learning	Q10	0	5.4	45.5	42.1	7	8	0.9
	Q11	0	8.1	33.1	50.8	8		
	Q12 ^b	2.3	12.1	47.3	27.3	11		
Attitudes toward science	Q13	0	3.3	23	56.7	17	8.1	1.2
	Q14	0	0	12	73	15		
	Q15 ^b	7.1	7.2	10.2	73.1	2.4		
Satisfaction for the class	Q16	0	2.1	8.1	81	8.8	7.3	1.1
	Q17	0	8.2	11.9	70	9.9		
	Q18 ^b	3.2	5.1	54	33.9	3.8		
Total	Q19	0	3	33.8	41.2	22	45.7	3.5

III. Conclusions and Recommendations

This study looked into effects of e-PBL program on "Impact of the Fukushima nuclear disaster to us" class. The result of study is, firstly, e-PBL System has improved students' 'self-directed learning ability'. It showed significant improvement in 'management of Motive', 'management of Cognitive', 'management of Behavior', and in detailed factors, 'love of learning', 'proactive planning', 'creative approach', 'future orientation', 'acceptance of responsibility for learning', 'inquisitive nature' have improved. This outcome is a result of participants planning and solving problems by themselves. Secondly, participants responded positively to e-PBL classes' 'Reality of

problems', 'adequacy of problems', 'Use of resources', 'Self-directed learning', 'Attitudes toward science', 'Satisfaction for the class'.

Through this study, it is possible to find out that PBL proves self-directed learning ability, and has positive effect in studying. But, due to the difficulties of making realistic and unstructured PBL problems, lack of class time, cooperation between departments, it is not easy to apply PBL in real life. In order to resolve this, it is necessary to develop the program and introduce the effect of e-PBL model.

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