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## Effects of Problem-Based Learning (PBL) in Fashion Design Classes

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### Abstract

In recent years, in order to enhance the problem-solving skills required by the industrial field, universities have introduced the Problem-Based Learning (PBL) method to solve the problems caused by the lack of creativity, problem solving ability and self-directed learning. This study applied PBL class methods such as 'learning based on individual specific problems', 'self-directed learning', and 'small-group learning of small members' to practical design of fashion design. To do this, I conducted a questionnaire after conducting research based on the PBL module for one semester in a practical class of fashion design major at P University. As a result of the survey, the satisfaction and achievement of the class conducted by PBL learning method was improved than the existing teaching method. As such, if PBL class is used as a way of solving problems through close communication between professors and learners, it is expected to be established as a learner-centered education method that can improve creativity and professionalism.

**Keywords:** Problem-Based Learning, Self-directed Learning, Minority Group Learning, Modules, practical issues

## 1. INTRODUCTION

In the field of diversified design education, instructors have conducted various studies to improve learners' practical problem solving ability according to social change. According to the recent [Industrial Design Statistics Survey 2017] [1], the reason for dissatisfaction with the employment force was the highest due to dissatisfaction with the workforce of 80.4%. In addition, the statistics survey pointed out that design major education, which should be reinforcement first in the university, is the biggest problem of university education, with 40.9% of 'design working competencies' [2]. In addition, it was analyzed that curriculum development and related classes should be activated for more efficient industry-academic cooperation class management at the university level. Therefore, the university considers that it is urgent to develop new subjects for effective education of major theory and practical knowledge, but it does not achieve great results. 'Problem-Based Learning (PBL)' began as a small group discussion class at Canadian Medical School in the 1960s and was used as a class to solve practical problems required in the field. It is also widely used in economics, architecture, technical engineering, chemical engineering, sociology, law, history, science, art and design. According to a study by Seo Yeon-hwa and Shim Hyun-ae (2019), learners acquire an integrated knowledge base through the process of PBL learning methods that solve authentic problems that are highly related to field practice. It is said that there is an advantage to cultivate practical competence by learning solution strategy, practical knowledge, skills and attitude [2]. Accordingly, this study aims to develop an effective educational program by applying the PBL model to fashion design classes to find the talent training methods needed in the fashion

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industry. The purpose of this study was to examine whether students contribute to achieving the goal of the class through self-induced response and responsibility for various practical issues.

## 2. THEORETICAL BACKGROUND

### 2.1 Concept of Problem-Based Learning

PBL was developed by professors Barrows and Tamblyn in the 1960s to improve the learning environment for students who are vulnerable to learning in a complex curriculum at McMaster University Medical School in Hamilton, Canada. It has been interesting to increase the level of motivation for the team, to recognize the importance of a responsible and professional attitude to the value of teamwork, and to select the issues that apply in practice. [3] In particular, Barrows developed the PBL methodology, thinking that medical students need not only to memorize information but also to use knowledge and a variety of higher-level problem-solving functions that can respond appropriately to the problems they will face in the future [4].

These PBLs can be subdivided into individual learning, self-directed learning, and small group learning. These PBLs can be used to study specific problems and facilitate relationships between individuals or minority groups faced by learners. Their learning effect will also increase. Therefore, PBL is a small group discussion class that can find information and solve problems through learner's experience or knowledge. It can be said to be self-directed problem-solving learning method to cultivate education [5].

### 2.2 Characteristics of Problem-Based Learning

In the study of Park Yang-mi (2013) [5], the characteristics of problem-based learning were presented in four ways.

First, learners take the lead in problem solving. Secondly, given problems are presented as complex problems and require complex and diverse solutions. Third, through group discussion, team members can take full advantage of the collaborative learning environment by conducting continuous verification and evaluation of interactions and individual understandings and knowledge. Fourth, professors have the role of facilitators helping learners to learn as problem developers.

PBL learning allows learners to explore and acquire the knowledge necessary to solve problems, so that learners can learn the need for knowledge acquisition and learn actively. Instructors also minimize delivery-oriented lectures, design problems as curriculum designers, prepare learning resources, organize groups of learners, provide assessments and feedback, and identify the importance of knowledge as experts to balance students. And as a facilitator to induce intrinsic motivation [6].

### 2.3 Progress of PBL Class

Barrows and Myers (1993) presented the key elements of the PBL course in seven steps [7].

First step, **the class introduction stage**: Orientation to explain the necessity, effect, and method of PBL class before presenting the problem. At this stage, it recognizes the role of the team such as team formation and unity of team members.

Second step, **the problem presentation phase**: present the problem to learners, explain the task to be submitted in the final step to understand the problem, and proceed to share the roles of the team members.

Third step, **problem analysis and resolution stage**: Each team prepares the first 'task performance plan', identifies the problems presented, and considers the problems from the four perspectives of ideas, facts, learning tasks, and future plans. The following steps are suggested.

- **Idea**: Hypothesis about the cause, effect and possible solution of the problem
- **Fact**: Learn what the learners already know to solve the problem
- **Learning issues**: Learners need to know to solve problems
- **Action plan**: Develops a plan or action plan for learners to do later, role sharing and individual study plan

to proceed with self-directed learning

Fourth step, **problem re-confirmation phase**: Re-evaluate the problem centering on the first task plan and prepare the second task plan.

Fifth step, **follow-up problem**: teams re-evaluate the problem and come up with the final solution, and repeat the problem re-confirmation process several times until the final solution is reached.

Sixth step, **the presentation and presentation phase**: The team will present the joint learning and final results and find the final solution.

Seventh step, **problem Conclusion and Post-Solution Step**: As the final step of the PBL class, the teacher's supplementary lectures and learners organize their learning results and evaluate their performance. In this process, feedback from the working site is received and reflected in the evaluation.

### 3. Problem-Based Learning (PBL) CLASSES IN FASHION DESIGN CLASSES

#### 3.1 Outline

The class model that introduced the PBL learning method in the planning stage of the fashion design major class was applied to the 3rd grade practical class for 6 semesters from the second semester of 2016 to the first semester of 2019.

As a practical problem required by the industry through pre-meetings with fashion companies before class, students formed a team in one semester and solved it in various ways.

#### 3.2 Class Case

The existing fashion design studio class was designed to produce clothes by treating students with various materials and applying them to jackets and coats through developing materials accordingly. However, by introducing the PBL class method, more practical problems can be suggested and solved. For this purpose, problems related to product development using functional fabrics produced in the northern part of Gyeonggi Province were presented and students could solve them <Table 1>.

Students were divided into groups of 5 to 7 students to work together to solve a given problem. During the 8 weeks from the mid-term exam period, the domestic market was investigated through the fabric market survey of the northern Gyeonggi area. It was encouraged to prepare a solution. In addition, based on the surveyed status, product development was carried out until the end of the period.

**Table 1. Problems Presented in PBL Classes**

Learning objectives	Example problem presented
1. Understand the status of well-being products using advanced materials	<p>“P Fashion Company is Korea's No. 1 company that sells functional products using advanced materials.”</p> <p>You are a designer at R Fashion, a competitor of the P-fashion company.</p> <p>After listening to the news of the fashion company's research and development, I researched "functional clothing that can change the temperature when wearing the human body" with team members to develop more future-oriented products. You should create and present a technical development document for functional product development that will increase sales and become a popular product and design a sample product.</p> <p>* Point 1: Product development proposal for “Functional clothing that can change temperature when wearing human body”</p> <p>* Point 2 : Product production and presentation of “Functional clothing that can change temperature when wearing human body”</p>
2. Understanding the concept of functional material	
3. Understanding the design process and suggesting the result through product development	
4. Learn how to create product development proposals	

<Table 2> is a team called ‘Rain Dust’ among 6 teams. It is a case study of product development through design developed by team members such as material research and research on functional fabrics and products based on fine dust and environmental problems. . The ‘Rain Dust’ team proposed the production of raincoats as a solution to the problem with the goal of "What is suitable for functional clothing using high-tech materials that can change the temperature?" It can be seen that we propose a fabric investigation that can change the temperature.

**Table 2.** PBL Case Study (Team name: Rain Dust)

Group activity journal			
Group name	Rain-dust	Date	May. 9 <sup>th</sup> . 2018
Attendants	Jang Ye-dam, Hwang Yeon-ju, Han Heung-gu, Yoo Soo-jong, Lee Han-hyuk, Lee Hee-ju, Song Woo-ram		
Meeting goal	What is suitable for functional materials using advanced materials that can change temperature?		
Problem solution		Fixed Problem solution	
Raincoat was selected as the most necessary item in the upcoming summer rainy season, and we decided to use the high-tech material heat-tech with the function of temperature change. Considering the drawback of moisture, which is a disadvantage of raincoats, it was suggested that a raincoat that is not moist and ventilated using a mesh material on the side or invisible part was suggested.		We tried to synthesize the waterproof function necessary for raincoat and the function of heat tech that can change temperature, but it emphasized that the air coat, which is a disadvantage of raincoat, was not ventilated, so that the direction of using high-tech materials that are waterproof and well ventilated rather than the function of heat tech I thought this would be better. We decided to use Gore-Tex because we thought that Gore-Tex, which is waterproof and water-repellent and well-ventilated, is suitable for making the raincoat we want.	

Students spend 8 weeks in the mid-term exams, researching trends and markets, designing concept maps, researching products using functional fabrics, and creating a variety of concepts for the final exams <Figure 1>. In this process, students share their roles and share their opinions through discussions. The instructor also encouraged the team to recognize the value of teamwork for creative product development.

Learning activities	Progress by week
Instructor	1. Explain learning objectives and present problems: Description of meetings with industry 2. Discussion on forming small groups
Learner	1. At weekly team meetings, we share ideas, discuss ways to solve problems, and collect data. 2. Produce output through market research and current status. <div style="text-align: center; border: 1px solid black; padding: 5px;"> <b>Result</b> </div>

Figure 1. Progress by week of PBL class

## 4. PBL CLASS SATISFACTION EVALUATION SURVEY

### 4.1 Group Evaluation

During the course of the PBL class, students completed the meeting record sheets, team activity sheets, and group evaluation sheets, and assessed their activities. As shown in <Table 3>, students evaluate the members' activities based on 13 evaluations. In this process, students carefully review the roles and activities of the team members for objective evaluation and score them. <Table 3> shows that A student who received the highest score got 48 points out of 65 points, while F student received the lowest score with 27 points, showing a difference of 11 points.

Table 3. Group evaluation

Group evaluation sheet							
* Please fill in the corresponding scores according to each criteria. (Very good/5, good/4, moderate/3, poor/2, very poor/1)							
Contents	Group name						
	A	B	C	D	E	F	
report - presentation	Clearly identified and approached what the problem requires	5	3	2	3	3	1
	Clearly understand the main concepts, procedures, and principals involved in the problem	5	2	2	2	4	1
	The data were thoroughly reviewed to resolve the problem	3	3	3	3	3	3
	Cited or referenced reliable sources	5	3	2	3	4	2
	Includes sufficient explanation, details, and appropriate examples	4	3	3	3	4	3
	A workable solution was presented	3	3	3	2	5	2
Presentation	It is written in the form of the final solution required by the problem.	3	3	3	3	3	3
	Important information was presented in the presentation	4	3	2	2	3	2
	The presentation was logically organized	3	2	2	3	2	1
	The presentation was attractively organized	3	3	3	2	2	2
	The presentation was presented to the audience for easy understanding	3	3	3	3	3	3
	The presentations helped other learners	3	2	2	2	3	2
The presenter clearly communicated the content		4	4	3	4	3	2
Total score		48	37	31	35	42	27

MEMO: The best part of problem solving and presentation by group and the part that needs improvement.

### 4.2 Class Satisfaction Survey

As a result of conducting class satisfaction surveys for students during the PBL class, the first survey conducted in the mid-term exam <Table 4> showed an overall average of 3.45 including problem satisfaction, learning outcomes, professor and student interaction, and overall class operation satisfaction. The second survey conducted after the final exam <Table 5> shows that the satisfaction level is raised to an average of 3.72. Learners find it difficult to solve PBL classes because they find it difficult to solve problems they face.

Therefore, the satisfaction level of the class is mostly lower at first than the general class. However, as students become more adaptive and self-directed in solving problems, they can see their academic achievement and satisfaction increase as they take responsibility for their classes.

Table 4. First Survey Statistics

	Subject Satisfaction	Learning outcomes	Professor-Student Interaction	Overall class operation satisfaction
Item count	25	25	25	25
Item Average	6.52	24.36	7.24	16.7
Ratio (%)	65.2	69.6	72.4	66.8
Overall average	3.45			

Table 5. 2nd Survey Statistics

	Subject Satisfaction	Learning outcomes	Professor-Student Interaction	Overall class operation satisfaction
Item count	25	25	25	25
Item Average	6.88	25.55	8.00	18.85
Ratio (%)	68	73	80	75.4
Overall average	3.72			

## 5. CONCLUSION

In recent years, problem-based learning has been introduced at universities, beginning with the development of new courses and the study of effective teaching-learning methods to effectively educate current theories and practical knowledge. PBL is a learner-centered teaching-learning method that presents unstructured problems and learners find and explore their own materials to solve problems. In the problem process, in consultation with learners, learners can gain relevant knowledge and develop problem-solving, cooperative, and self-directed learning skills. As such, research on PBL teaching method is expanding through the demands and trends of a society that values creative education.

Particularly, fashion design practical class has learner-centered characteristics but it lacks theoretical knowledge acquisition. Therefore, PBL, which is one of the teaching models, is an appropriate teaching method for practical class.

In this study, students applied the PBL class to the 3rd grade fashion design class, and presented practical problems required by the industry. Students will learn the spirit of cooperation and share their roles among various discussions and team members to solve practical topics. The instructor watched the students' discussions and gave them explanations or advice to help them understand what they could not solve. In addition, the instructor conducted a questionnaire on academic achievement and learning experience after the class was completed to draw applicability and implications. Through the survey, the suggestions for improvement of learners' PBL learning method are as follows.

First, it proceeded with a full understanding of the new teaching method and needs to resolve the burden on unfamiliar and scientific themes and problem solving.

Second, there is a need for more detailed criteria for the division of roles and evaluation of team members, including measures to overcome difficulties in communicating with group members in group lessons and the use of penalties for non-participants.

Third, it was hoped that several rounds of meetings with industry would be conducted for knowledge of expertise and feedback in the problem-solving process.

It has not been long since PBL has been applied to design education, but if PBL is used as a way to solve problems through close communication between professors and students, learners can be more creative and improve their professionalism in practice. It is expected to be a central education method.

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