

## A Study on the Applications of English Science Class using PBL

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### 초등학교에서 PBL을 이용한 영어과학 수업의 실제적 적용에 관한 연구

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**Abstract** In order to attain the best-educated people in a rapidly changing, modern society with English is an official language, this study applies the problem-based learning (PBL) method to the English Science Class. PBL problems were developed for PBL classes, and their effectiveness has been proven. The focus of this study was five PBL questions posed during the first semester, targeting seven learners in the fourth grade of Elementary School A. The questions were divided into levels aimed at each grade, with the emphasis on specialized English education. Learners wrote journals, peer evaluations, and self-evaluations after finishing their PBL classes. Also, a survey about PBL was conducted after the first semester. The results of the study showed that learners experienced an 86% improvement in presentation skills, an 86% improved interest in learning, 86% better understanding, and 100% improvement in both problem-solving skills and cooperation. On the other hand, learners had difficulty in understanding PBL problems, and with research using the internet. PBL was somewhat unfamiliar to the students, but the survey found that learners are already aware of its effectiveness, and that they are interested in PBL.

**요 약** 영어가 세계 공용어로 자리매김 될과 더불어 다양한 방면에서 급격히 변화하고 있는 현대사회가 추구하는 인재상을 기르기 위해 본 논문은 PBL 학습법을 영어과학 수업에 적용하였다. PBL 수업을 위하여 직접 PBL 문제를 개발하여 수업에 적용하였으며 PBL 학습 효과를 확인하였다. 본 논문의 연구 대상은 외국어 특성화 교육이 중점이 되어 각 학년당 수준별로 나뉘어 분반 수업으로 진행되는 A 초등학교의 4학년 상반에 속한 7명 학습자를 대상으로 1학기 동안 5개의 PBL 문제 활동이 모두 끝난 후 PBL 학습에 대한 설문을 받았다. 연구 결과는 PBL 활동을 통해 발표력 향상 86%, 학습에 대한 흥미도 86%, 학습에 대한 이해력 향상 86%, 문제해결능력 향상 100%, 협동력 100% 효과를 학습자들이 경험할 수 있었다. 반면에 처음 접한 활동이라 이해하기 어려움, 문제에 이해에 대한 어려움, 인터넷을 통한 자료조사에 대한 어려움이 도출되었다. PBL 학습은 학습자들에게 다소 생소하였으나 활동을 통해 중요성 및 효과성을 인식하고 있었으며 큰 관심을 보인 점을 보았을 때 교육 현장에서는 더욱 PBL 적용에 힘써야 하는 큰 시사점을 준다.

**Keywords** : Cooperation, PBL, Presentation Skills, Problem-Solving Skills, Understanding Skills

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## 1. Introduction

As English becomes the official language, the objectives of education should be to develop communication skills, teamwork, debate skills, creative thinking, and problem-solving skills, which are the virtues of the modern society, which is rapidly changing in many ways and it is simultaneously instructor's responsibility. But the reality of education is regarded as a requirement for entering prestigious schools and careers. John Dewey, who was the most aware of these problems, emphasized learning subject knowledge should be from life experience, but today's schools do not. Inquiry learning and project learning is developed by Dewey's educational theory but these methods also have limitations on linking real-life and subject knowledge[1].

The educational method that emerged from this problem is PBL learning method based on constructivism. Constructivism considers learner-centered educational environment important, and knowledge is acquired by social interaction, not by individual cognitive action. Looking at Vygotsky's constructivism from a linguistic point of view, ZPD(Zone of Proximal Development) facilitates the development of better communication skills with the assistance in social interaction [2-3]. Therefore, the English learning method based on PBL has various effects. Today's instructors should take responsibility to study the effectiveness of PBL more and try to make learners familiar with PBL beyond the traditional method.

This study will introduce PBL concept with characteristics, PBL instructional design, procedures of developing PBL problems, research method and survey results after applying PBL method to the English Science class.

## 2. Body

### 2.1 Theoretical background of PBL

#### 2.1.1 PBL concept

PBL (Problem-Based Learning) was founded in 1969 by Barrows who was a professor in McMaster medical school. Because he found medical students had difficulty caring real patients after having long education. PBL is a teaching-learning method that develops learning ways to improve the functions and abilities for treating patients in medical schools.

PBL is a model in which learners solve their problems by themselves rather than traditional teaching-learning method which simply transfers knowledge to learners[4]

#### 2.1.2 The characteristics of PBL

The characteristics of PBL are as follows[1-6].

- (1) The problems of PBL which generate only one answer are not well-structured but an ill-structured problem that requires various methods.
- (2) The problems in PBL is close to the real life.
- (3) Learning is conducted through the learners' activities, not the instructor's one-way lecture.
- (4) PBL gives the learner ownership of the group activity.
- (5) PBL provides the learning environment in which learners can take part in activities voluntarily.

#### 2.1.3 PBL learning method

A typical PBL instructional design is a PBL learning method by Barrows & Myers (1994)[6].

First step, an instructor introduces lesson development.

Second step, presenting problems, introducing learning assignments, discussing the problem solutions, assigning roles, writing a project plan are conducted. In a project plan, ideas, facts, learning issues, and action plans are included.

Third step, learners seek solutions based on sharing learning materials and information, exchanging opinions.

Fourth step, learners write a report on the problem solutions and present by a group.

Fifth step, journals, self-evaluation, and peer-evaluation are conducted.

## 2.2 PBL instructional design

The environment of PBL should be designed that learners can take ownership of learning and participate actively and voluntarily.

PBL learning method designed by Barrows (1994) which is mainly used in medical schools is composed of lesson development phase, problem follow up phase, presentation results phase, and evaluation phase. Kang In-Ae (1998), who introduced PBL into Korea, developed a class atmosphere, presented problems, attempted potential problem solving, self-learning, cooperative learning and discussion results, arrangement, and evaluation to apply PBL to elementary social studies; there are 7 stages.

In this study, the English Science class is designed based on ADDIE(Analysis, Design, Development, Implementation, Evaluation) model.



Fig. 1. ADDIE Model

## 2.3 Procedures of developing problems of English Science

Although PBL started from a medical school, it has proved its effectiveness and it is applied to all subjects or integrated subjects. But applying PBL to English class is still difficult due to the reality of English education focusing on entering prestigious schools and careers. In order to cultivate creative talents in the age when English is the official language, this study presents

procedures of developing problems of English Science.

### 2.3.1 Considering the curriculum

The first step of developing the PBL problems is considering the curriculum. Learners can acquire knowledge in the process of problem solving and achieve the goal. Therefore, clear learning objectives make PBL class active.

In the school where this study was conducted, the English education is specialized, and the immersion program, which teaches other subjects in English, is being implemented. Among six chapters of life science in the English science curriculum, five chapters are suitable for the PBL problem. Five problems were developed as shown in Table 1.

Table 1. The PBL Problems of Life Science

Problem 1 Types of pollution and how to solve pollution	Chapter 4 Lesson 1 Living Things Change Their Environments
Problem 2 The some ways to change the environment	Chapter 4 Lesson 2 Change Affect Living Things
Problem 3 The reasons that living things become extinct	Chapter 4 Lesson 3 Living Things of the Past
Problem 4 Types of Ecosystems	Chapter 4 Lesson 2 Types of Ecosystems
Problem 5 How to survive in each adaptation	Chapter 3 Lesson 3 Adaptation

### 2.2.2 Identifying the learner characteristics

Identifying the learner characteristics is important to problem development. Survey about learner characteristics and interests and teacher's observation are conducted for learner's motivation and challenge.

In the school where this study was conducted, learners take part in English class every day since the first grade due to specialized English education. Classes are divided by learner's level for each grade level. Learners who belong to the upper class studied in English kindergarten before entering school, attending overseas training during vacation, or engaging in private tutoring. The other results of identifying the

learner characteristics is some learners are interested in Science while others are not. Above all many learners feel English is difficult. In addition, learners think learning Science in English may be hard as well.

### 2.2.3 Finding the problems

The characteristics of PBL problems should be related to the curriculum and suitable for objectives of education. Various solutions and answers can be generated and the problems should be related to reality. Therefore, an instructor needs to collect news articles or social issues for the lesson. For the English science PBL class of this study, science-related magazines, news, and newspapers can be used to construct problems linked to educational goals. In the PBL lesson, "problem" is an important role of learners so continuous research on problem development should be conducted.

### 2.2.4 Setting up the roles and situations

Learners should solve the problems voluntarily and actively so setting up the roles and situations is an important design process. Through this process, learners can take part in the PBL activity with ownership.

### 2.2.5 Creating the problems

After setting up the roles and situations, an instructor should create the problems of learners. Learners should understand their roles and situations and define the problems. Also, problems should be ill-structured and relevant to reality and make learners participate voluntarily and actively. Through this, learners can sort out difficult words or terms in the problem, arrange various opinions on discussion with other peers, and lead to problem discovery. The way of presenting the problem is an explanation, video clips, handouts, articles, newspaper, or brainstorming. After constructing the problem, it

is necessary to examine whether it is appropriate to the level of the learner, whether the information is well provided for the inquiry, and whether the characteristics of the learner are well reflected.

This completed the PBL problem of the English Science class. The educational objective of Chapter 3 Lesson 2 Types of Ecosystems is to know about types of ecosystems. The problem is as follows.

[Scenario]

What if you live in the sea? Can people live in the sea of water? How can fish live? Animals and plants live in their own ecosystems as people have their houses. How sea animals live in freshwater? Investigate the types of ecosystems to publish an article on Yujung Science Magazine. Prepare it a Powerpoint.

Question #1 What is a desert?

Question #2 What is a forest?

Question #3 What is an ocean?

Question #4 What is a wetland?

## 3. Research Method

### 3.1 Study object

The school A, the research site, is divided into classes of each grade level for English specialized education, and PBL classes were conducted for seven learners in the upper class.

### 3.2 Lesson design

#### 3.2.1 Problem development

There are six chapters in Life Science. Among them, PBL problems were developed based on educational objectives and contents suitable for PBL.

#### 3.2.2 Instructional Procedures

This PBL class lasted 20 weeks per semester.

Instructional procedures are first teamed up for PBL activities. Three to four learners are in a group. Each PBL problem takes for 4 to 5 weeks. In the first activity, students identify problems presented by the instructor, discuss them, and prepare and present a work plan. In the second activity, group members write a report and present. In the third activity, problem solutions should be drawn up in the Powerpoint, Word Processor or any other form given by the instructor and it should be presented. After presentation, journal, self-evaluation, peer-evaluation are conducted. The journal asks learners to describe what they have learned, felt, and how to incorporate it into their life. After all PBL activities were completed, a survey was conducted on the overall PBL.

## 4. Survey Result

After PBL was applied to the English Science class, a survey was conducted because the effectiveness and difficulties of PBL class should be found for further research and to develop a better class. In addition, learners may be able to be aware of importance of PBL class. The questionnaire was consisted of 21 questions. They were composed of questions about the usefulness of understanding the contents of the class, satisfaction of the PBL, and difficulties of the PBL activities. The response form of the questions was written in multiple choice and the difficulties were described. The item scale is 5 points (1-not at all, 2-not, 3-normal, 4-yes, 5-very). A total of respondents are seven.

### 4.1.1 The effectiveness of the PBL class

The survey asks about the presentation, understanding of the lesson, problem-solving skills, cooperation, and interest. Types of answers are not at all, not, normal, yes, very. As a result, the respondents who answered yes, 86%

presentation skills, 86% interest in learning, 86% understanding skills and 100% responded to problem-solving skills and cooperation on learning.

### 4.1.2 Satisfaction with PBL class

Learners were highly satisfied with PBL class. They were well-motivated and responded that they would like to continue this way.

### 4.1.3 Difficulties of PBL class

When asked about the difficulties of PBL class, they said that it was difficult to understand PBL lesson at first, discuss and investigate with peers, read and understand the problem. In addition, researching data in the internet was difficult for them.

## 5. Conclusion

Already developed countries are actively studying PBL, leading to revision and reorganization of the curriculum. In Korea, PBL is applied to English education for communication skills. However, high score, entering prestigious schools, careers are still goals of education in reality. It still comes out a teacher-centered class, acquiring knowledge for good answers only, and uniform evaluation. To recover this problem, the English science class was deigned by PBL lesson and it was conducted for 20 weeks. In result, 86% presentation skills, 86% learning interest, 86% understanding skills, 100% problem-solving skills and cooperation were responded. Otherwise, understanding PBL lesson at first, discussing and investigating with peers, reading and understanding the problems, researching data in the internet were learners' difficulties.

This study shows that the integration of PBL class into English, the world's official language, is very important and that instructors in each field should take responsibility for further research.

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<관심분야>

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