

The Impact of the Project-Based Learning Method on Students

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Abstract. With the development of science and technology, Problem-based Learning (PBL) has gradually attracted people's attention, which has become an important issue about how to enable students to develop more. This paper mainly analyzes the previous studies to illustrate the different effects of PBL model education on students, especially when being compared with traditional model education methods. This paper not only examines the effects of PBL, but also the underlying reasons of these effects. Results show that PBL positively impacts students compared with traditional education. Also, it can improve students' active thinking, hands-on, and teamwork cooperative ability. These positive effects can help students adapt to future work and project learning. Meanwhile, the reason for these positive effects is the change in PBL and traditional teaching methods.

Keywords: Project-Based Learning; Impact on Students; Analysis of Past Papers.

1. Introduction

With the development of science and technology, education has become a heated and critical issue. At the same time, the requirements for students have gradually changed from having sufficient ability in majors to requiring students to develop in an all-around way. At this time, a new educational model entered people's field of vision. The teaching method known as project-based learning (PBL) is founded on constructivism, which John Dewey initially put forth at the end of the 1890s [1-2]. Hence, what changes make PBL different from the traditional education model? This study will review past articles on PBL and analyze the research and conclusions in the papers. This article will mainly discuss what can positive effects PBL bring to students, how these images are produced, and how these effects will help students. At the same time, this paper analyzes with examples to ensure that these effects are real.

2. Comparing PBL and Traditional Education

This paper is mainly about the influence and mechanism of PBL. In this situation, this paper will introduce the definition of PBL. PBL, whose full name is Project-Based Learning, was defined as a study model based on projects [3]. At the same time, PBL takes students instead of teachers as the education center [4]. These evaluations define PBL in form and terms of impact. PBL also has its definition. The effect is mainly reflected in the overall enthusiasm of students [4], which can be divided into three main parts: active thinking, hands-on, and teamwork cooperative. These three impacts will be discussed in the next section.

In general, what is the difference between PBL and traditional education? To answer this question, the first issue to understand is traditional education. As introduced above, PBL always puts students at the center. However, formal education puts the teacher at the center, dominating teachers [5]. Unlike PBL, which improves the overall enthusiasm of students, formal education usually imparts knowledge directly by teachers, while students only passively accept and remember knowledge [6]. This can lead to students losing interest in learning, lack of creativity, and the consequences of critical thinking [7]. From these perspectives, one of the most significant differences between traditional education and PBL is that traditional education is usually dull to students, and teachers impart knowledge into students. However, PBL is traditionally based on authentic problems and guides students to think actively. Another gap between traditional education and PBL is students' ability to connect what they have learned. It is challenging to connect knowledge between different courses.

The understanding among various disciplines is relatively independent. PBL is to guide students to independent thinking so that students can integrate and apply knowledge of multiple subjects.

To sum up, PBL is an education model based on projects. Compared with traditional education, PBL pays more attention to students instead of teachers. At the same time, PBL is more accessible for students to think actively and try their best to connect and use all their knowledge.

3. The Impact of PBL on students

3.1 Active Thinking Ability

An essential impact of PBL on students is to exercise students' active thinking ability. As being introduced above, the traditional education method is more inclined to impart knowledge directly to students and learn knowledge through memorization and recitation. In contrast, PBL is more prone to exercise students' critical thinking and creativity, which are two essential parts of active thinking skills. In this situation, PBL will positively impact students' active thinking ability. One of the examples to show the positive effect on students' creativity is Usmeldi's study [8]. Usmeldi mentioned that PBL cultivates students' creativity by allowing students to take the initiative to think about problem-solving methods [8]. From this point of view, PBL is one of the most appropriate ways to exercise students' creativity. Usmeldi's study proves this point [8]. The study is about the differences in students' ability to learn physics in traditional education mode and PBL mode [8]. The result of this study is that compared with conventional education methods, PBL is more efficient, which has more and better effects on students' learning outcomes [8]. This result proves that PBL is helpful for students' creativity.

On the other hand, from the teachers' aspect, PBL also shows its massive influence on students' critical thinking. According to Issa & Khataibeh, from a teacher's perspective, students who receive a PBL education possess the highest levels of critical thinking [6]. Considering that critical thinking is an important part of active thinking ability, it can also be concluded that PBL positively impacts students' active thinking ability compared with traditional teaching models. Based on these examples, PBL can exercise students' active thinking ability.

Here comes another question: Why is students' active thinking ability important to develop and exercise? According to Usmeldi's study, this study also discusses the importance of active thinking ability and creativity [8]. Usmeldi emphasized that those students who have high creativity have better learning [8]. This result means that students' learning outcomes are often closely related to students' creativity. Also, Issa & Khataibeh pointed out that student self-control, adherence to correctness, reliability, and clarity regarding the themes and issues they are exposed to are all facilitated by critical thinking [6]. It makes it possible for individuals to make thoughtful, suitable decisions without bias. These ideas show the importance of active thinking skills. In addition, Usmeldi also discusses that boosting creativity and learning through PBL complement each other [8]. PBL helps students develop creativity and critical thinking skills. These two skills also help students learn in PBL. Based on this, PBL modes positively influence students' active thinking skills, and students' active thinking skills can help them study PBL modes better.

In general, PBL can help students develop active thinking skills, mainly by exercising their creativity and critical thinking skills. At the same time, having better active thinking skills can help students to perform better in PBL.

3.2 Hands-on Ability

Developing hands-on skills is also a positive effect of PBL. As introduced in section 2.1., in traditional education, knowledge is usually imparted directly by teachers, and students memorize and recite. Under this circumstance, it is hard for students to practice their hands-on ability since they have fewer opportunities to use their hands. However, in PBL, students can use more hands-on ability, which is led by the changes in education methods. Before discussing how PBL improves students' hands-on ability, it is also worth discussing why hands-on ability is essential. Hands-on ability is necessary for practice and in students' future work. This is because students who lack hands-on ability

have difficulty applying their knowledge, which is obtained by memorization, directly to practical problems [9]. PBL can avoid challenges in using knowledge issues by allowing students to practice in the classroom.

How does PBL help students develop their hands-on ability in this situation? According to Hren et al., in PBL, students are encouraged to be actively involved in "producing things" rather than "learning about" something [9]. Students, who study in PBL, can practice their hands-on ability by doing their work. This is because students need to practice independently rather than acquire knowledge by memorization. One example is based on Lu's study [10]. This study is focused on English writing, and students wrote directly in English, revised, and continued writing after receiving teacher feedback [10]. This project has directly exercised the students' hands-on ability, shown here as the students' English writing ability. This study shows that PBL is very effective in improving students' English writing ability [10]. This result also indicates that PBL can help students improve their hands-on ability. In addition, improving hands-on ability can help students work in the future. Students can gain valuable experience working directly on projects or experiments, whether they succeed or fail. For students who fail in the project, project practice helps them gain experience and avoid future failures caused by similar problems. Successful students successfully understand what they have learned and apply the knowledge to real-world problems. From two aspects, the improvement of hands-on ability positively impacts students.

To sum up, PBL gives students more opportunities to conduct in-person experiments and complete assignments or projects. As a result, students can better develop and practice hands-on ability in PBL than in traditional education. On the other hand, the better hands-on ability is helpful for students' future jobs.

3.3 Teamwork Cooperative Ability

Another essential impact of PBL on students is to develop students' teamwork cooperative ability. Since traditional education usually learns knowledge by reciting memory, it is difficult for students to get the opportunity to exercise cooperation and communication skills. To a certain extent, this will result in students lacking the ability to work with others. From another perspective, in PBL, students will get more opportunities to try to cooperate with others. In the process of cooperation, students' teamwork cooperative ability will be exercised. According to Lau et al., PBL aids in the growth of cooperation abilities in students, including goal-setting, collaboration, and communication [11]. These three abilities are indispensable in interpersonal communication, study, and work. Lack of communication and cooperation skills will not be helpful for students to form an effective and efficient cooperative environment with their peers. And the lack of ability to set goals might reduce students' opportunities to do practical work because the lack of goals may result in students not having a clear judgment on what to do now. This may lead to many detours during work or projects.

How does PBL improve students' teamwork cooperative skills? Many PBLs require students to work in small groups compared to traditional education [12-14]. Students will be forced to do teamwork even if they are unwilling to do so. This gives students a foundational background to exercise their teamwork cooperative skills. The atmosphere among good teams is pleasant and mutually helpful [12]. There will be a friendly, mutual supervision atmosphere among peers. In this atmosphere, students will effectively communicate and cooperate with their peers. Also, in this atmosphere, peers can play a role in reminding students, which is helpful for students to establish goals. However, not all teamwork can ensure good results. According to Jaiswal et al., some students prefer to work independently [15]. However, this can be improved with the group teacher's help [16]. The study by Jaiswal et al. demonstrates this [15]. Research has shown that overall, the impact of PBL on students' abilities to work in teams is positive.

In addition, one more reason why PBL improves teamwork cooperative ability is about peer-feedback. Receiving or giving peer feedback is an excellent opportunity for students to collide with each other. Students can communicate with their peers and gain new insights [13]. This kind of advancement of thinking is helpful for teamwork cooperative ability.

In summary, PBL can help students exercise their teamwork cooperative ability, allowing them to adapt better to future work or projects. Developing students' teamwork cooperative ability helps them exercise their communication and cooperating skills, which is also helpful for their daily lives. The commands to give peer feedback and set goals are also beneficial. Even for students who prefer to work independently, studying at PBL can benefit them from teamwork.

4. Case of PBL

As introduced above, PBL can positively impact students in different ways, including active thinking, hands-on, and teamwork cooperative. This section will mainly focus on a specific case, the study of Supe & Kaupuzs, about English learning [14]. This study is about using PBL for teaching and whether students learn English better and achieve better results [14]. This study adopts an experimental research method and compares students' attitudes toward English learning after PBL education [14]. In this way, the influence of PBL on students' learning interests becomes clear. This section will mainly analyze the advantages of students' group learning in PBL in this study to illustrate how PBL positively affects students in three aspects: active thinking ability, hands-on ability, and teamwork cooperative ability.

Firstly, there are two advantages of "active thinking ability". The first is that students actively learn new vocabulary; the other is practicing different skills, such as art, music, and computing [14]. Under the traditional mode of education, students rarely memorize new English words actively, because they do not need to use these new words. However, in this study, students actively learned new words to be able to complete the project because students need more knowledge to help them achieve their tasks. Active learning in art, music, and computing is the same reason. This kind of active learning about new knowledge is usually challenging in traditional education, because in traditional education, students rarely have the opportunity to learn new knowledge actively. From the aspect that students will actively learn new knowledge, PBL positively impacts students' active thinking ability.

From the perspective of hands-on ability, the most prominent advantage of PBL in this study is that students speak more English than in traditional [14]. Speaking English is one of the important ways of learning English. Hence speaking English can also be regarded as a kind of hands-on ability about English. In traditional classrooms, teachers impart knowledge directly to students [6]. This situation results in students having few opportunities to be able to have a conversation in English. At the same time, even if there is an opportunity for dialogue, it is usually conducted with the teacher, which means that the English proficiency of both sides of the discussion is very uneven. This is not beneficial for English learning. However, in the PBL course, students can use English to practice their English with peers whose English level is not much different from theirs. This gives students more opportunities to have English conversations. Also, when talking with classmates from a similar class, students do not have the confidence they may have when speaking with their teachers, which is caused by the fear of making mistakes due to various differences in level.

The last one is about PBL and teamwork cooperative ability. This study mentions the improvement of organizational ability, the demonstration of good communication and cooperation ability, good cooperation with school staff, and the determination of teamwork goals [14]. Improving organizational skills helps students better assume leadership positions when working in groups. At the same time, in a team, the leader usually sets the team's goals and leads the team forward. From this perspective, setting a good teamwork goal improves organizational and leadership skills. Therefore, PBL can help students improve their organizational skills and the ability to determine teamwork goals, which helps improve students' team leadership skills.

On the other hand, good communication and cooperation skills show that PBL improves team members. These can help students better complete team projects and communicate effectively with peers. This is good for the all-round development of students. At the same time, cooperation with school staff helps students to develop their communication and cooperation skills outside the team, avoiding the trouble that students can only cooperate and communicate with peers or familiar people.

Good communication and cooperation skills and friendly collaboration with school staff. They all prove that PBL has improved the teamwork cooperative ability of ordinary group members who are not leaders.

Overall, this case reflects the positive impact PBL can have on students differently. These positive effects include 1) improving active thinking ability, which can help students learn actively; 2) improving students' practical ability avoids the phenomenon that students are only good at listening, instead of speaking and other partial subjects; 3) improving students' teamwork cooperative ability from both the leader's and the member's perspectives.

5. Conclusions

To sum up, through reviewing past research and its results, this paper finds that PBL can positively affect students more than traditional teaching methods. These effects include active thinking skills, hands-on skills, and teamwork cooperative skills. PBL improves these abilities by allowing students to enhance their critical thinking skills and creativity, actively understand and learn new knowledge, experience learning content in person, and cooperate with group members. At the same time, PBL can help students develop more comprehensively and adapt to future projects or jobs. PBL can positively affect students because PBL encourages students to Think actively, not passively accept knowledge. From these perspectives, it is worth promoting the adoption of PBL to replace traditional teaching methods because PBL can better meet the needs of society for the comprehensive development of students.

This paper mainly provides a reference for other research on why PBL is superior to traditional education models and what impact PBL has on students. In addition, this paper helps provide ideas for more research on the advantages of PBL. However, this article also has limitations. It is mentioned in the report that some students may, for some reasons, such as wanting to work independently, not suitable for the existing PBL teaching method. In response to this question, research on PBL can focus on how to design PBL courses that can broadly help various levels of learning.

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