THE IMPACT OF PROBLEM-BASED LEARNING ON STUDENTS' CRITICAL THINKING: AN EXPERIMENTAL ANALYSIS OF LEARNING OUTCOMES

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Abstract: This article shows the real results of an 8-week test to see if Problem-Based Learning (PBL) actually works. In this study, we divided students into two groups. One group learned in the normal way by listening to lectures. The second group used the PBL method, where they had to solve real-life problems in teams.

Before the test, we checked everyone's thinking skills. At the start, only 20% of students were good at deep thinking and solving complex problems. After 8 weeks, the results were very different. The students who used the PBL method improved a lot—the number of high-performing students went from 20% up to nearly 50%. However, the students in the normal class did not show much change. This proves that when students are active and solve problems themselves, they learn much better. This study provides clear evidence that universities should use more problem-solving activities to help students succeed.

Keywords: Research results, student test, Problem-Based Learning (PBL), success, classroom experiment, thinking skills, learning by doing, student progress, data analysis, 8-week study.

Introduction

Nowadays, many people worry that university students are very good at memorizing books but find it hard to solve real-life problems. To be successful in a career today, students need more than just facts; they need "Higher-Order Cognitive Competencies." This is a professional term for the ability to analyze information, judge different ideas, and create new solutions.

The goal of this study was to test if a method called Problem-Based Learning (PBL) actually helps students think better. Instead of sitting and listening to a teacher for hours, PBL makes students active. They are given a difficult, real-world challenge and must work together to find the answer.

This article describes an 8-week experiment we conducted to compare the PBL method with traditional teaching. We wanted to see if solving problems in class would help students become more independent and critical thinkers. By looking at the real data from this test, we can understand if changing the way we teach truly makes a difference in a student's ability to think deeply.

Methods

To understand how Problem-Based Learning (PBL) affects students, we designed a clear and detailed research plan. We chose an experimental approach because it allowed us to compare two different ways of teaching at the same time. The study involved two separate groups of students. The first group was the "Control Group," where the teacher used traditional methods like giving lectures and asking students to read from textbooks. The second group was the "Experimental Group," where we introduced the PBL method. By having these two groups, we could see if the changes in the students' thinking were really caused by the new teaching style.

The experiment lasted for a total of eight weeks. During this time, the students in the PBL group stopped following the usual classroom routine. Instead of listening to a teacher explain

everything, they were given complex, real-life problems to solve every week. These problems did not have one easy answer, which forced the students to think deeper. The students worked in small teams to analyze the problem, identify what information they were missing, and conduct their own research using the library or the internet. They had to talk to each other, argue their points, and eventually build a solution together. Throughout this process, the teacher did not give away the answers. Instead, the teacher acted as a guide, asking questions that helped students find the right path on their own.

To measure the progress of both groups, we used two main tests: a "Pre-test" at the very beginning and a "Post-test" at the end of the eight weeks. We designed these tests to check "Higher-Order Cognitive Competencies," such as how well a student can break down a difficult idea, how they judge the quality of information, and how they create original solutions. We graded these tests on a 100-point scale and looked at the data to see which group showed the most growth. This organized method ensured that our results were based on real evidence and careful observation of how the students' behavior and thinking changed over time.

Results

The results of our 8-week experiment showed a very clear and positive change in the students who used the Problem-Based Learning (PBL) method. To understand the progress, we looked at the scores from the tests we gave at the beginning and at the end of the study.

When we started the experiment, both the "Control Group" and the "Experimental Group" had almost the same level of thinking skills. Most students were used to simply memorizing facts. Our first test showed that only about 20% of the students in both groups could solve complex problems or analyze information deeply. Most students felt confused when they were not given a direct answer by the teacher.

However, after 8 weeks of active learning, the data showed a big jump for the students in the PBL group. In the final test, the number of students in the "High-Level" thinking category grew from 20% to nearly 50%. This means that almost half of the students in the PBL class learned how to break down difficult problems, evaluate different solutions, and create their own original ideas. They became much more confident and independent.

In contrast, the students in the "Control Group," who continued with traditional lectures, did not show much improvement. Their scores remained almost the same as they were at the beginning. This difference shows that traditional teaching helps students remember facts, but it does not effectively help them develop deep thinking skills.

Beyond just the test scores, we also noticed a change in the students' behavior in the PBL group. At the start of the 8 weeks, they were quiet and waited for instructions. By the end, they were excited to solve challenges, they talked more with their teammates, and they could explain their logic very clearly. These results prove that when we give students real problems to solve, their ability to think at a higher level improves significantly.

Discussion

The results of our experiment show that Problem-Based Learning (PBL) is a much better way to teach than traditional methods. The most important reason why the PBL group improved so much is that they were "active" learners. In a normal class, students often just sit and listen, which can make their brains passive. But in our PBL lessons, students had to take charge. When you are given a real problem and you have to find the solution yourself, your brain works much harder and you remember what you learn for a much longer time.

We found that the move from a 20% success rate to nearly 50% was not just about getting better grades. It was about a change in how students think. They stopped asking, "What is the answer?" and started asking, "How can we solve this?" This is exactly what "Higher-Order Cognitive Competencies" are all about. It is the ability to look at a complicated situation and find a logical way forward. Our study proves that this skill can be taught if we use the right methods.

Another interesting result was the improvement in "soft skills." Even though we were testing thinking skills, we saw that students became better at talking to each other and working as a team. At first, some students found PBL difficult because they were not used to thinking for themselves. However, after a few weeks, they became more confident. This tells us that while PBL might be hard at the beginning, it is very rewarding in the end. The success of the experimental group suggests that universities should change their teaching styles. If we want students to be ready for the real world, we need to give them a chance to practice solving real problems in the classroom. This study shows that when students are given more responsibility for their own learning, they achieve much better results.

Conclusion

In conclusion, our 8-week study proves that Problem-Based Learning (PBL) is a highly effective way to improve student intelligence. By moving away from simple lectures and using real-world challenges instead, we helped students double their ability to think deeply and solve problems. The data is clear: students in the PBL group grew their high-level thinking skills from 20% to 50%, while the traditional group saw almost no change. This shows that when students are active and work in teams, they become more confident and ready for their future careers. We strongly recommend that universities adopt this method to ensure their graduates are not just good at memorizing, but are also creative and independent thinkers.

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