THE EFFECTS OF PROBLEM-BASED LEARNING ON GRADE 11 STUDENTS' ECONOMICS ACHIEVEMENT

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Abstract

The study aimed to investigate the effects of problem-based learning on Grade 11 students' economics achievement. A quantitative research method was used to compare economics achievement between the students who received instruction with problem-based learning and those who did not. The design applied was a quasi-experimental study with a nonequivalent control group design. The sample schools were randomly selected and the groups were intact. There were 102 participants Grade 11 students from two schools in Sagaing Township. Learning materials were selected from the Grade 11 Economics Textbook: Chapter 4 (Money and Banking). To establish the reliability of the instruments, a pilot study was conducted with (35) Grade 11 students. The reliability level of Kuder-Richardson for the pretest items was (0.97) and the value of Cronbach's alpha for the posttest questions was (0.73). After the treatment, the data obtained were analyzed by using the independent samples *t* test. The results revealed that there were significant differences in economics achievement between the students who received instruction with problem-based learning and those who did not receive it at $p<.01$. By using Cohen's *d*, the values of effect size (0.83) and (1.1) for both schools were larger than typical. It was proved that the experimental groups got better economics achievement than the control groups. This research highlights that problem-based learning is a more effective and well-equipped approach to raising economics achievement and problem solving skills.

Keywords: problem, learning, problem-based learning, economics, achievement

Introduction

Today, the amount of knowledge is as rapidly explosion as the problems people face in the global society. People need to know how to solve problems in their daily lives and how to handle the predicament tactfully. So it is urgently demanded to find ways that students not only need to have the body of knowledge but also need to be able to apply it to solve complex problems in meaningful ways. Successful problem solvers possess the foundation of knowledge and master the skills to utilize the existing knowledge in problem solving. Delisle (1997) stated that all education involves either problem solving or the preparation of problem solving which is important for students facing hard challenges in real life. From calculations of economics problems to literary analysis to economics issues investigation, teachers who teach economics direct students how to answer questions and solve problems.

When strategically posed, problems and questions with associated economics issues can enhance the depth and quality of thinking (Tan, 2003). The focus here is intellectual problem solving for real-world application in learning. Tan (2002) explained that the goals of problem-based learning are content learning, acquisition of discipline-related heuristics, and development of problem solving skills. Problem-based learning also includes the life-wide learning goals of self-directed learning, information-mining skills, collaborative and team learning, and reflective and evaluative thinking skills.

Economics is the social science that relates to the ends and scarce. Based on scarcity, people have to choose to fulfill their wants and needs. Doing the right things right enhances

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problem solving skills with logical methods rather than normative ones with vague judgments (Robbins, 1984). It does not primarily stand on the collection of facts to memorize although there are plenty of concepts in economics to learn (Steven & David, 2011). Delisle (1997) suggested that the ordinary teachers emphasize facts and procedures without giving opportunities to build sound knowledge instead of skipping the formal teaching approach for economics that focuses on transmitting knowledge, skills, and attitudes. In this situation, economics teachers need to consider whether problem-based learning or formal instruction can enhance students' insight. This is the reason why this study aims to investigate the effects of problem-based learning on Grade 11 students' economics achievement.

Purpose of the Study

The major purposes of the study are as follows:

1. To investigate the effects of problem-based learning on Grade 11 students' economics achievement.
2. To present the economics achievement of Grade 11 students who receive instruction with problem-based learning.
3. To make suggestions and recommendations for developing teaching economics based on the study results.

Research Questions

The following research questions are set down to carry out the purposes of the study.

1. To what extent does problem-based learning affect Grade 11 students' economics achievement?
2. How does the economics achievement of the students who receive instruction with problem-based learning differ from that of those who do not receive it in answering remembering, understanding, applying, and analyzing level questions?

Definition of Key Terms

Throughout the study, five key terms are used. It is necessary here to clarify exactly what is meant by the words: problem, learning, problem-based learning, economics, and achievement.

Problem **:** A problem is defined as a situation or a task that is difficult to control due to complexity and opaqueness. In everyday language, a problem is a question proposed for a solution, a matter stated for examination or proof (Seel, 2012).

Learning **:** Learning is the change of behavior through direct or indirect experiences (Mangal & Mangal, 2019).

Problem-based learning **:** Problem-based learning is a student-centered approach in which students learn about a subject through the experience of problem-solving (Nilson, 2010).

Economics **:** Economics is the social science that deals with how people make choices about ways to use limited resources to satisfy their unlimited and competing wants (Clayton, 2008).

Achievement **:** Achievement is an individual proficiency level in a given area of knowledge or skills by measuring academic achievement tests (Noori, 2021).

Scope of the Study

This research study is geographically restricted to No. (1) Basic Education High School and No. (3) Basic Education High School in Sagaing Township, Sagaing Region. The participants from the selected schools were Grade 11 students in (2023-2024) Academic Year. In this study, the experimental groups receive instruction with problem-based learning, and the control groups also receive formal instruction for the same topics. This study is conducted with the content area of Chapter 4 (Money and Banking) from the Grade 11 economics textbook.

Review of Related Literature

Theoretical Framework of Problem-Based Learning

Problem-based learning was first rooted in cognitive theory in which learning focuses on students' insight. Cognitivist theorists seek to understand how individuals learn and what goes on inside the mind when learning occurs (Schmidt, 1983 as cited in Linden & Alanko-Turunen, 2006). According to Thamrin and Hutasuhut (2017), problem-based learning focuses on helping students build their knowledge through real-world problem-solving efforts in a structured way. Savin-Baden and Major (2004) stated that students utilize their previous knowledge and ways of thinking and construct knowledge into a new form that is understandable and meaningful to them. John Dewey's, Piaget's, and Vygotsky's theories are major works of problem-based learning.

History of Problem-Based Learning

In the early 1950s, a pedagogical approach to problem-based learning has relatively emerged in medical education such as the New Mexico Medical Colleges and the Harvard University of Medical School (Cuban, 1999). According to Barrows and Tamblyn (1980), students explored a problem situation and then examined their knowledge gaps based on the findings of the exploration to decide what information they needed to acquire or what information they needed to resolve the situation in which they were presented.

In the latter half of the twentieth century, Savin-Baden and Major (2004) described that the use of problem-based learning expanded in education and other professional fields. In secondary education, teachers and students have grappled with questions in ways that are engaging, challenging, and productive in an environment where they can safely take academic risks. From the modern perspective, teachers are not authoritative experts; rather they participate in inquiry. They are co-learners so there is a shift away from patrollers and controllers of knowledge. Problem-based learning has developed as an essential approach in the evolution of teaching and learning in academics.

Phases of Problem-Based Learning

There are five phases of problem-based learning. The teacher begins to introduce the problem situation and ends with the reflection and evaluation of students' work. Tan (2003) developed the five phases of problem-based learning.

Phase 1. Meeting the problem

The problem scenario acts as a stimulus to scaffold and extend a realistic context students might encounter in the future. This means that students are asked about their previous knowledge of real-life situations. For example, to teach the functions of money, the teacher begins to ask the

question. Imagine the most important things for a person who stays conveniently in daily life. This question leads to students' interest in economics issues concerned with the importance of money for livelihood. The next step is to define and analyze the problem of this concept.

Phase 2. Problem analysis and learning issues

The students' prior knowledge is activated and the teacher gives questions to discuss new learning. For instance, the second task of students is to discuss the functions of money for better explanations of the issues and questions posed. People exchange goods and services to fulfill their needs and wants. The functions of money play a vital role in the exchange system. The results of the discussion or the solutions to problems are reported in the next step.

Phase 3. Discovery and reporting

Students report their discovery of learning to their own groups. They gather to share the new information they have individually discovered. The teacher trains students to have group collaboration and communication skills through questions and encourages them to seek further information from one another. It is followed by the example that the teacher also helps students learn the key areas of the functions of money and the evocation of money to solve the weakness of the barter system and obtain accurate and valid information for them.

Phase 4. Solution presentation and reflection

After students have presented their solutions to the problem scenario, they reflect on their knowledge acquired such as the functions of money and the evocation of money or legal tender to solve the weakness of the barter system. This involves contextualization and application of the knowledge to the situation. Teacher helps students be aware of gaps and correct misconceptions.

Phase 5. Overview, integration, and evaluation

The review and evaluation process is important to synthesize students' ideas. The teacher encourages students how to criticize the new knowledge they have learned.

In the problem-based learning process, the teacher pays close attention to students' thoughts through the problem solving steps. The teacher also evaluates the results of whether the problems and questions presented acquire the new concepts or the desired learning outcomes.

Advantages and Disadvantages of Problem-Based Learning

Shoimin (2014, as cited in Mahardik, Subiki & Maimunah, 2017) described that there are several advantages of problem-based learning. They are:

- Students are encouraged to have the ability to solve problems in real situations.
- Students can build their knowledge through learning activities.
- Learning to focus on issues that matter and that have nothing to do not need to be learned by the students. This reduces the burden on students by memorizing or storing information.
- Students accustomed to using resources have better knowledge of the library, the internet, interviews, and observations.
- Students can assess their own learning progress.
- Students can conduct scientific communication in discussion or presentation of the results of their studies.

- Individual students' learning difficulties can be overcome through group work in the form of peer teaching.

However, Wirantaka and Sukarno (2022) suggested that problem-based learning has many limitations as follows:

- If the teacher does not prepare carefully the problem-based learning process, this will affect students' understanding.
- Initially, it takes time to solve a problem until students reach a solution.
- Experience teachers or enthusiastic teachers are needed to apply problem-based learning in the economics classroom.

Research Method

Population and Sample Size

The sample schools were selected by the use of the simple random sampling method of Mills and Gay (2016) to carry out the research. The selected schools were two Basic Education High Schools: No. (1) BEHS and No. (3) BEHS Sagaing, Sagaing Township, Sagaing Region. The participants in this study were selected as intact groups from two classes of the schools. The sample size and population size for the two selected schools are presented in Table1.

Table 1 ***Population and Sample Size***

Name of Schools	Population Size	Sample Size		
		Group	Number of Subjects	Total
BEHS 1	150	Experimental	27	57
		Control	30	
BEHS 3	102	Experimental	23	45
		Control	22	

Note. BEHS 1 = No. (1) Basic Education High School, Sagaing
BEHS 3 = No. (3) Basic Education High School, Sagaing

Research Design

A quasi-experimental study with a nonequivalent control group design has been adopted to explore the results of whether a problem-based learning approach affects teaching economics or not (Mills & Gay, 2016).

Research Instruments

The instruments were constructed under the selected design to conduct this experimental research. Therefore, (1) a pretest and its marking scheme, (2) learning materials or sample lesson plans that are based on problem-based learning and (3) a posttest and its marking scheme for quantitative research were used.

Pretest

This study used a pretest to determine group equivalence between experimental and control groups. Pretest items were constructed based on the content areas of chapters from one to three in Grade 11 economics textbooks. It consists of (30) multiple-choice items and its marking scheme. For validation, the pretest questions and their marking scheme were distributed to the

experienced teachers from Sagaing University of Education. After that, test items were modified again according to their suggestions.

To establish the reliability of the instruments, a pilot test was administered with (35) Grade 11 students at the Basic Education Practicing High School Shwe Min Wun, Sagaing Township, Sagaing Region. After that, internal consistency among the pretest items was analyzed by using Kuder-Richardson 20, and the reliability level of KR-20 was (0.97). This result was clear evidence to use pretest questions for the main study.

Posttest

The posttest was constructed to measure the economics achievement of Grade 11 students. It consisted of 15 objective test items and others for essay test items. This test was developed based on Chapter 4 (Money and Banking) for measuring the four levels of Bloom's taxonomy: remembering, understanding, applying, and analyzing (Anderson et al., 2001).

To get validation, the posttest questions and their marking scheme were distributed to the experienced teachers from Sagaing University of Education. Test items were modified to their suggestions. To get reliability, the pilot study was conducted for one week. The allocated time for the posttest was (1:00) hour and the given marks were (50) marks. After the pilot period, the items were analyzed by reliability statistic with Cronbach's alpha and got the reliability level (0.73). This finding result is relevant for the main study to evaluate the economics learning outcomes.

Procedure

To carry out an experimental study, a quasi-experimental design was used. At the start of the study, two classes will be randomly selected from each school as intact groups. These two groups were assigned the experimental and control groups. Then, two groups were administered a pretest to determine the level of performance of the participants for comparison. The means of the groups were calculated by using independent samples *t* test to determine group equivalence. The lesson plans were prepared for the experimental and control groups before the study. Procedures for problem-based learning are developed by using five steps: meeting the problem, problem analysis and learning issues, discovery and reporting, solution presentation and reflection, and overview, integration, and evaluation (Tan, 2003). While the experimental groups received instruction with problem-based learning, the control groups received formal instruction on the same content for the same period. After the treatment period, the posttest was administered to both groups.

Data Analysis

To be able to determine whether there is a significant difference in economics achievement between the experimental group and the control group, the post-test scores were analyzed by using an independent samples *t* test.

Research Findings

Findings of Students' Basic Economics Knowledge

Before the treatment began in each school, the students from two groups were examined on their basic economics knowledge with the independent samples *t* test to study whether their knowledge was equivalent. The data obtained from the pretest are shown in Table 2.

Table 2 ***t Values of Students' Basic Economics Knowledge***

School	Group	*n*	*M*	*SD*	*MD*	*t*	*df*	*p*
BEHS 1	Experimental	27	19.81	4.46	1.51	1.37	55	.18 (ns)
	Control	30	18.30	3.87				
BEHS 3	Experimental	23	18.65	3.82	- 0.08	- 0.06	43	.95(ns)
	Control	22	18.73	4.74				

Note. BEHS 1 = No. (1) Basic Education High School, Sagaing.
BEHS 3 = No. (3) Basic Education High School, Sagaing.
ns = not statistically significant.

According to the results, there were no statistically significant differences in basic economics knowledge between experimental and control groups in both schools.

Findings of Students' Economics Achievement on Posttest

Since it was found that the two pretest mean scores in both schools were not initial differences, the independent samples *t* test was only used to analyze the posttest scores to present the effects of problem-based learning on Grade 11 students' economics achievement (Mills & Gay, 2016, p.540). In addition to statistical significance, the effect size was also examined to indicate the magnitude of these differences. Cohen (1988, cited in Morgan et al., 2013) developed the effect size (*d* family) to measure the absolute magnitude of the coefficient, rather than its significance. The guidelines for interpreting the size of the effect are provided by four levels: $d \geq .20$ is small or smaller than typical, $d \geq .50$ is medium or typical, $d \geq .80$ is large or larger than typical and $d \geq 1.00$ is much larger than typical. The results of the current study are given in Table 3.

Table 3 ***t Values of Students' Economics Achievement on Posttest***

School	Group	*n*	*M*	*SD*	*MD*	*t*	*df*	*p*	*d*
BEHS 1	Experimental	27	37.19	7.05	6.66	3.14	55	.003**	.83
	Control	30	30.53	8.76					
BEHS 3	Experimental	23	39.00	9.33	9.86	3.67	43	.001**	1.1
	Control	22	29.14	8.64					

Note. BEHS 1 = No. (1) Basic Education High School, Sagaing.
BEHS 3 = No. (3) Basic Education High School, Sagaing.
**$p < .01$. Effect Size: $d \geq .80$. $d \geq 1$.

The results of this study were separately indicated for both schools. In No. (1) Basic Education High School (Sagaing), there were significant differences in economics achievement between the students who received instruction with problem-based learning and those who did not receive it at $p < .01$. Interestingly, the value of effect size (.83) was larger than typical which means the effects of problem-based learning are strength on the economics achievement. The finding of No. (3) Basic Education High School is similar to that of No. (1) Basic Education High School. The most striking result to emerge from the data is that the effect size (1.1) was much larger than typical.

According to the results of overall post-test scores, the mean differences in economics achievement are in height between the experimental and control groups in both schools. Thus, the experimental groups got better economics achievement than the control groups. Figure 1 is illustrated the comparison of mean scores for both groups.

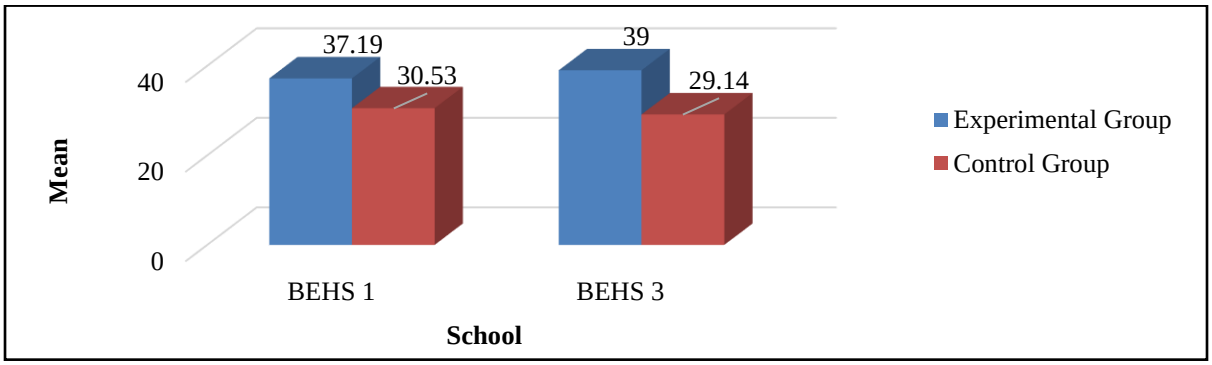

Figure 1. Comparison of mean scores for posttest.

According to the figure, this study has evaluated that problem-based learning can contribute to some extent to improving students' economics achievement in answering remembering, understanding, applying, and analyzing level questions.

Findings of Students' Economics Achievement on Remembering Level Questions

Table 4 t Values of Students' Economics Achievement on Remembering Level

School	Group	n	M	SD	MD	t	df	p
BEHS 1	Experimental	27	8.44	3.43	0.04	0.04	55	.97 (ns)
	Control	30	8.40	4.65				
BEHS 3	Experimental	23	11.09	1.35	1.23	1.79	43	.08 (ns)
	Control	22	9.86	2.92				

Note. BEHS 1 = No. (1) Basic Education High School, Sagaing.
BEHS 3 = No. (3) Basic Education High School, Sagaing.
ns = not statistically significant.

The findings of remembering level for both schools proved that there were no significant differences in economics achievement of students who received instruction with problem-based learning and that of those who did not receive it. This is the reason why students who received instruction with problem-based learning acquired the facts and concepts in such ways by solving problems while students who received formal instruction learned the facts and concepts from their mastery teacher and memorize them carefully. So, they had the same level for answering remembering level questions. Figure 2 is pointed out the comparison of mean scores for remembering level questions.

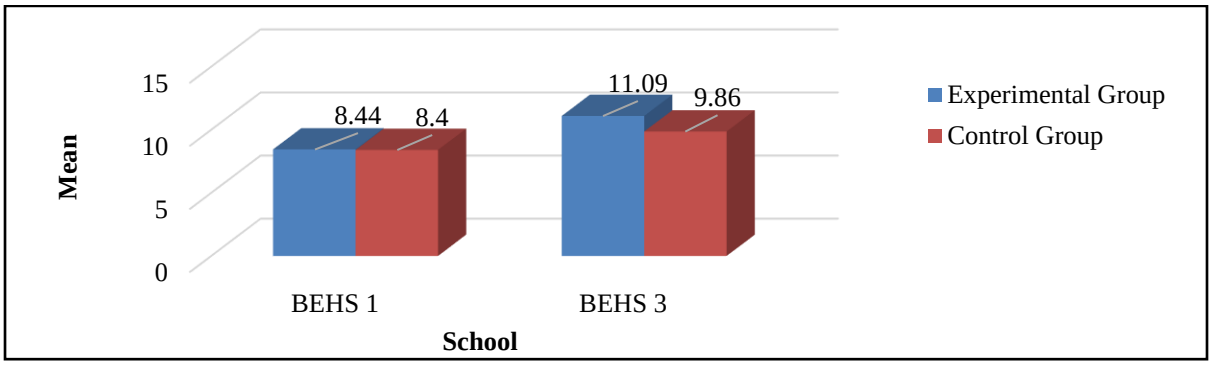

Figure 2. Comparison of mean scores for remembering level questions.

As students for experimental and control groups had the same level in answering remembering level questions, problem-based learning can support memorizing factual economics knowledge as the formal instruction in both schools.

Findings of Students' Economics Achievement on Understanding Level Questions

Table 5 t Values of Students' Economics Achievement on Understanding Level

School	Group	n	M	SD	MD	t	df	p	d
BEHS 1	Experimental	27	7.70	2.16	0.57	0.84	55	.40 (ns)	-
	Control	30	7.13	2.93					
BEHS 3	Experimental	23	9.00	2.76	3.05	3.72	43	.001**	1.1
	Control	22	5.95	2.73					

Note. BEHS 1 = No. (1) Basic Education High School, Sagaing.
BEHS 3 = No. (3) Basic Education High School, Sagaing.
ns = not statistically significant. $^{**}p < .01$. Effect Size: $d \geq 1$.

According to the results of understanding level questions, the two studies differ in each school. In BEHS (1), there were no significant differences in the economics achievement of students who received instruction with problem-based learning and that of those who did not receive it. However, there were statistically significant differences for both groups in BEHS (3). The effect size, 1.1 was much larger than typical. Figure 3 is revealed that comparison of mean scores for understanding level questions.

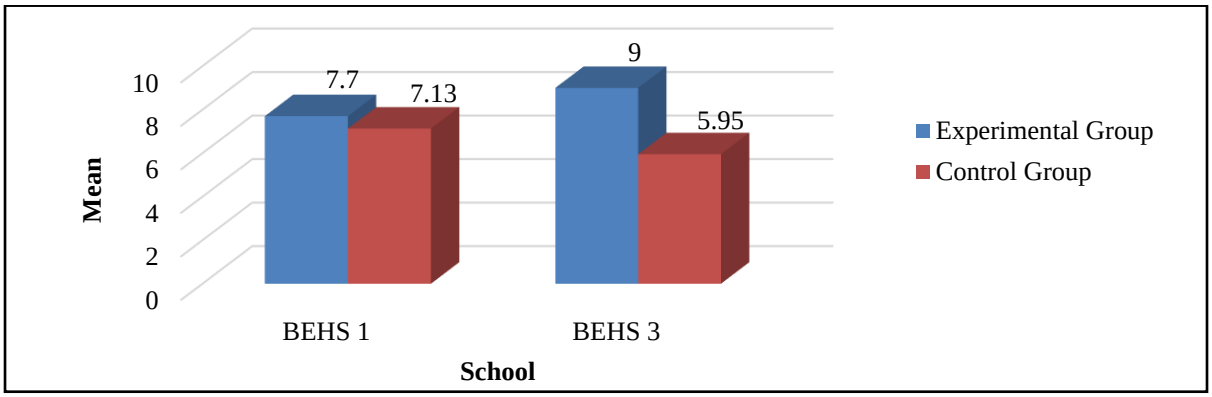

Figure 3. Comparison of mean scores for understanding level questions.

Although the finding of BEHS (1) indicated that problem-based learning does encourage as meaningful learning as formal instruction, the findings of BEHS (3) completed the effect of problem-based learning as better than formal instruction in teaching economics.

Findings of Students' Economics Achievement on Applying Level Questions

Table 6 *t Values of Students' Economics Achievement on Applying Level*

School	Group	*n*	*M*	*SD*	*MD*	*t*	*df*	*p*	*d*
BEHS 1	Experimental	27	9.11	2.08	2.01	3.22	55	.002**	.85
	Control	30	7.10	2.58					
BEHS 3	Experimental	23	8.61	2.86	2.29	2.71	43	.01*	.81
	Control	22	6.32	2.82					

Note. BEHS 1 = No. (1) Basic Education High School, Sagaing.
BEHS 3 = No. (3) Basic Education High School, Sagaing.
$^{*}p < .05$. $^{**}p < .01$. Effect Size: $d \geq .80$.

The evidence of this study suggested that the experimental groups were significantly higher than the control groups in both schools. There were statistically significant differences in answering applying level questions between the students who received instruction with problem-based learning and those who did not receive it. The values of effect size in both schools highlighted that the magnitude difference in the economics achievement used in problem-based learning is larger than typical. Overall, this study strengthened the idea that problem-based learning provides totally in teaching economics. Figure 4 is showed that comparison of mean scores for applying level questions.

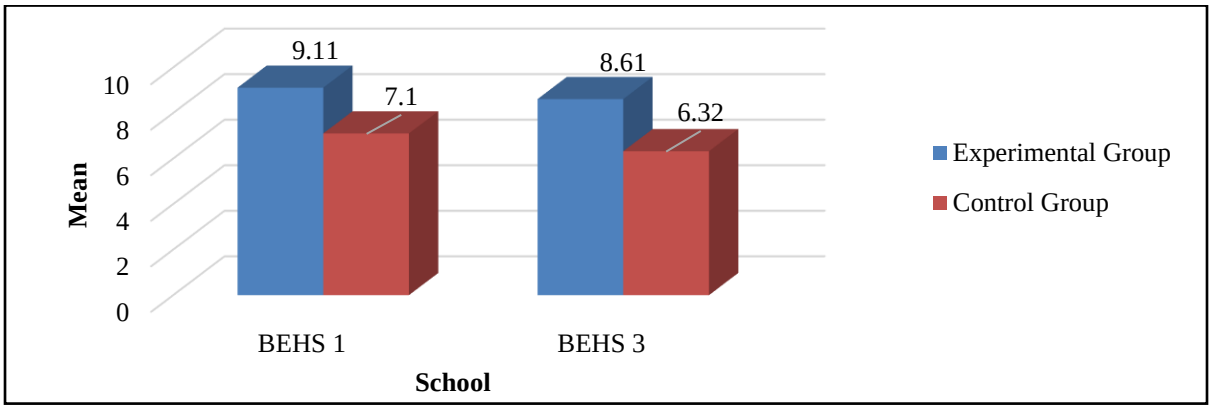

Figure 4. Comparison of mean scores for applying level questions.

The results of this study supported that problem-based learning is effective in solving economics problems.

Findings of Students' Economics Achievement on Analyzing Level Questions

Table 7 t Values of Students' Economics Achievement on Analyzing Level

School	Group	n	M	SD	MD	t	df	p	d
BEHS 1	Experimental	27	11.93	2.80	4.03	4.59	55	.000***	1.2
	Control	30	7.90	3.79					
BEHS 3	Experimental	23	10.74	4.13	3.83	2.92	43	.006**	.9
	Control	22	6.91	4.66					

Note. BEHS 1 = No. (1) Basic Education High School, Sagaing

BEHS 3 = No. (3) Basic Education High School, Sagaing

$^{**}p < .01$. $^{***}p < .001$. Effect Size: $d \geq .80$. $d \geq 1$.

The findings of both schools enhanced the understanding of the effects of problem-based learning on Grade 11 students' economics achievement because there were statistically significant differences in answering analyzing level questions between the students who received instruction with problem-based learning and those who did not receive it. According to the values of effect sizes, the magnitude of difference in economic achievement between the experimental groups and the control groups was larger than typical. Figure 5 is described the comparison of mean scores for analyzing level questions.

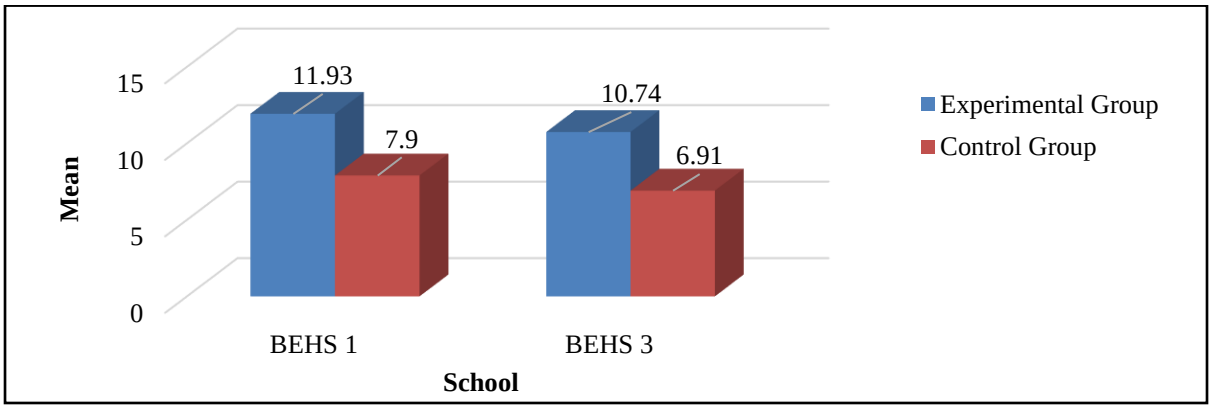

Figure 5. Comparison of mean scores for analyzing the level questions.

The findings of this study proved that problem-based learning is particularly relevant for teaching economics to develop procedural knowledge.

Conclusion

Discussion

This section is to reflect on the extent to which this study is based on research findings. This discussion is enlightened two research questions.

(1) To what extent does problem-based learning affect Grade 11 students' economics achievement?

To satisfy this question, the overall post-test findings revealed that there were significant differences in economics achievement between the students who received instruction with problem-based learning and those who did not receive it at $p < 0.01$. To express the extent of mean differences, the values of effect size were computed. These values (0.83 and 1.1) were larger than typical. Together these results provided important insights into the effects of problem-based learning on economics achievement. Specifically, students who are exposed to problem-based learning can organize their thoughts in an orderly manner which is essential for problem solving. Narmaditya, Winarning, and Wulandari (2017) supported the same findings. It highlighted the effects of problem-based learning that can improve students' achievement. Considering all of this evidence, problem-based learning provides better achievement levels than formal instruction.

(2) How does the economics achievement of the students who receive instruction with problem-based learning differ from that of those who do not receive it in answering remembering, understanding, applying, and analyzing level questions?

The findings of the second question were discussed individually. **For remembering level**, there were no significant differences in the economics achievements of the students who received instruction with problem-based learning and that of those who did not receive it for both schools. Students for both groups may answer definitions of economics terms by memorizing them or by building their own experiences. This finding is similar to the result of Masek & Yamin (2012).

The findings of understanding level got separated. For BEHS 1, there were no significant differences in the economics achievements of the students who received instruction with problem-based learning and that of those who did not receive it. This finding is consistent

with the results of Kasuga, Maro, and Pangani (2022). In contrast, there were significant differences in the economics achievements of the students who received instruction with problem-based learning and that of those who did not receive it at BEHS 3. Senyigit (2021) supported that problem-based learning is more effective in improving conceptual understanding and overcoming misconceptions than lecture-based learning.

According to the applying level's findings, there were significant differences in the economics achievements of the students who received instruction with problem-based learning and that of those who did not receive it for both schools. The most interesting finding to emerge from the mean differences is that the values of effect size are larger than typical. Together these results suggested students do better understand how to solve problems using problem-based learning. This finding is similar to the results of Bukari & Asiedu-Addo (2019). It was found that problem-based learning helps to develop good problem solvers.

The last finding of the analysis level is that there were significant differences in economics achievement of students who received instruction with problem-based learning and that of those who received formal instruction. In particular, the values of effect size to determine the magnitude of difference in economics achievement between problem-based learning and formal instruction were larger than typical. Based on these results, problem-based learning improves reasoning skills. This result was complemented by Wahyu, Sahyar and Gintings' (2017) study of problem-based learning improves students' critical thinking and problem-solving ability.

Overall, this study strengthens the idea that problem-based learning can enhance Grade11 students' economics achievement. This is due to the effects of problem-based learning on teaching economics, teachers who teach economics need to convey the use of problem-based learning in formal classrooms to achieve certain objectives effectively.

Suggestions

After discussing the questions posed at the beginning of this study, it is now suggested for teachers and students that problem-based learning can be implemented in teaching economics.

Suggestions for teachers

(1) Teachers should prepare the real-life problems related to the contents that they teach.
(2) Teachers should encourage students to participate in solving economics issues about the subject area.
(3) Teachers should encourage students to cooperate within a group and discuss, solve problems, and make decisions together. Choosing the right decision reduces the fear of solving problems.
(4) If classroom culture is not ready, teachers should tackle it successfully to remove hostile behavior within group activity and train their students to have collaborative skills.

Suggestions for Students

(1) Students should actively engage in their learning process by solving problems instead of receiving information from teachers.
(2) Students should identify and analyze problems such as exploring what they already know, what information they acquire, and how they solve it.
(3) Students should report and reflect on their findings.
(4) Students should be problem solvers and have logical manners instead of practicing what they have learned as formal instruction.

Recommendations

The current study leaves many important questions unanswered because a key limitation is to investigate whether problem-based learning affects economics achievement. The following recommendations are provided for implementing future research.

(1) This study aimed to compare the economics achievement of students who received instruction with problem-based learning and that of those who did not receive it as a quantitative study. Further research should include qualitative or mixed-method studies to explore a deeper understanding of learning outcomes.

(2) Further experimental investigations should also be needed to explore the difficulties of teachers or teachers' integration in problem-based learning.

(3) The present study was confined to teaching Grade 11 economics. Further experiments should be undertaken in Grades 10 and 12 economics.

(4) The current study was simply implemented by applying the steps of problem-based learning. Further work should be needed to fully understand the implications of problem-based learning based on technology.

(5) Further study would be interesting in comparing academic achievement between problem-based learning and other non-formal instruction techniques.

Conclusion

The main goal of the current study was to investigate the effects of problem-based learning on Grade 11 students' economics achievement. One of the quantitative research methods used is a quasi-experimental study with a non-equivalent control group design. Two sample schools were selected by a simple random sampling method. The participants were intact groups in each school. The two groups in each school were examined for the pretest to determine group equivalence. Then, the experimental groups received instruction using problem-based learning, and the control groups received formal instruction. After the treatment, the results were analyzed using independent samples *t* test. It was found that there were significant differences between the students who received instruction with problem-based learning and those who did not receive it. The values of effect size were calculated to describe exactly the magnitude of differences. Considering the results of the findings, problem-based learning was effective in the power of teaching economics as well as economics achievement. In addition, solving problems, discussing ideas within the group, making decisions, reporting their understanding and reflecting on their solutions can support communication, collaboration, and critical thinking of 21st century skills. So, not only does problem-based learning strengthen the body of knowledge but it also contributes to 21st century skills.

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