PROBLEM-BASED LEARNING METHOD AND THE LEARNING OUTCOMES IN SCIENCE 9

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ABSTRACT

This study aimed to determine the learning outcomes of the students in Science 9 through the use of different problem-based learning methods. Furthermore, this attempted to determine the student performance outcome as to their problem-based learning in terms of explanatory knowledge, descriptive knowledge, procedural knowledge, personal knowledge. Likewise, this study aimed to find out if there was a significant difference in the students' problem-based learning outcomes when grouped according to the teaching method as to explanation problem, fact-finding problem, strategy problem, and moral dilemma. Using an experimental design of research, it involved four groups in Grade 9 at San Antonio National High School with 40 students each during the Academic Year 2020-2021. A teacher-made module and performance task rubrics were used to measure the learning outcomes of the students when group according to the problem-based learning method which was validated by the panel of experts. The study used descriptive statistics such as frequency, percentage, mean and standard deviation to interpret the scores in the performance outcome of the respondents. Analysis of Variance (ANOVA) was also used to determine the possible presence of a significant difference in the students' problem-based learning outcomes when group according to the teaching method. Result revealed that there is a significant difference in the students' problem-based learning outcomes when group according to the teaching method as to explanation problem, fact-finding problem, strategy problem and moral dilemma. It also showed that students performance outcome as to their PBL in terms of explanatory knowledge, descriptive knowledge, procedural knowledge and personal knowledge fall under the category of proficient level.

Keywords: Problem-Based Learning, Learning Outcomes, PBL method, Science 9

INTRODUCTION

Science has shaped the world by making sense on the complex events and ideas about natural phenomena. It serves as a driving force of a country's ability to continue to innovate, lead and create jobs for the future. The knowledge in science is essential in comprehending current events, choosing and using technology, or making informed decisions about one's health care (National Research Council, 2013).

Rabino (2014) points out that in order for a developing country like the Philippines to keep abreast with the rapid advancement of science and technology, it is important to put emphasis on the quality of science education, particularly in the acquisition and enhancement of knowledge and skills to meet the demands of the highly competitive and scientifically inclined society.

Pursuing the raise the quality of education in the country, DepEd continuously implements innovations in science. Science Education Program of K to 12 centers around curriculum that challenges and arouses learner's curiosity and encourages them to learn and appreciate science

as relevant and useful in their daily lives (Reyes, 2015).

According to DepEd Order No.43, s. 2013, the Philippines' grades 1-10 science curriculum envisions the development of scientifically, technologically, and environmentally literate and productive members of society. They must possess effective communication, scientific values and interpersonal and lifelong learning skills that would lead to rational choices on issues confronting them. The acquisition of these domains can be developed through a curriculum that focuses knowledge relevant to real world and incorporates methods of inquiry.

The implementation of K to 12 basic education programs seeks to provide the Filipino learners with the necessary skills and competence to prepare them to take on the challenges of 21st century. It aims to make basic education system in the Philippines at par with international standards by ensuring that it is appropriate, responsive, and relevant to the learners (DepEd Order No. 21 s. 2019).

UP NISMED (2004) believes that the high level of accomplishments of Filipino students in the field of science internationally are overshadowed by the consistently poor performance of Filipino students in international assessment studies and national assessment studies. Studies suggest that Filipino students fail to attain the set performance standard in terms of comprehension, reasoning, and analytical skills.

Based on the result from Trends in International Mathematics and Science Studies (TIMMS) conducted in 2003, Philippines ranked 43rd among 46 countries. The low academic performance was also felt in the 2012 National Achievement Test (NAT) where science got the lowest mean percentile score (MPS) among the five core subjects (Naval, 2014).

Another challenge that the Philippine educational system is facing nowadays deals with coping up with the educational paradigm shift in the midst of COVID 19 pandemic, with lack of access to the technology and insufficient budget, DepEd is looking for ways to facilitate and innovate in order to provide quality education for the Filipino students. With the massive shift in education this school year, DepEd formulated different alternative modes of delivering learning to meet the needs of the learners regardless of who and where they are.

In line with the above-mentioned statements, an enhanced learning strategy from the teachers should be developed for the students to retain interest, cope up and adjust on the curriculum as science requires broad understanding. With this, it can be inferred that learning can be processed, improved and retained, thus the use of problem-based learning method was conceived.

OBJECTIVES OF THE STUDY

This study attempted to: 1) determine the student performance outcome as to their problem-based learning in terms of explanatory knowledge, descriptive knowledge, procedural knowledge, personal knowledge; 2) describe students' performance outcome as to teaching method and 3) find out if there is a significant difference in the students' problem-based learning outcomes when grouped according to the teaching method as to explanation problem, fact-finding problem, strategy problem, moral dilemma.

METHODOLOGY

The researcher employed experimental design. The point of the study was to examine any observed differences between and within the groups. The group participants were formed by random assignments. The experimental groups were to be taught using different modular problem-based learning method. All groups were given same set of lessons discussed and set of performance task rubrics per problem-based learning method to attain comparable results.

The experimental group belonged to the Grade 9 classes of San Antonio National High School. The researcher used four sections in Grade 9 with 40 students each. All groups composing heterogeneously students were all of the same age and level in terms of prior knowledge of the topics covered in Grade 9 Science and who served as respondents of the study.

A teacher-made module and performance task rubrics were the primary instrument for this study. The teacher-made module consisted of learning objective, introduction of the topic and different learning tasks that centered on explanation problem, fact-finding problem, strategy problem and moral dilemma. The performance task rubrics consisted of indicators such as outstanding (8pts), proficient (6pts), developing (4pts) and beginning (2pts). Different indicators were grouped according the learning outcomes such as explanatory knowledge, descriptive knowledge, procedural knowledge and personal knowledge. It was adjacent to the competency for the third quarter of K-12 science curriculum guide.

The study used descriptive statistics such as frequency, percentage, mean and standard deviation to interpret the scores in the performance outcome of the respondents. Analysis of Variance (ANOVA) was also used to determine the possible presence of a significant difference in the students' problem-based learning outcomes when grouped according to the teaching method.

RESULTS AND DISCUSSION

1. Student Performance Outcome as to their Problem-Based Learning

1.1. Performance Outcome of Students as to their Problem-Based Learning in Explanatory Knowledge

Table 1
Performance Outcome of Students in Explanatory Knowledge

Scores	Explanation Problem		Fact-Finding Problem		Strategy Problem		Moral Dilemma		Interpretation
	F	%	F	%	F	%	F	%	
31-40	11	27.5	9	22.5	7	17.5	-	-	Outstanding
21-30	27	67.5	23	57.5	21	52.5	25	62.5	Proficient
11-20	2	5	8	20	12	30	15	37.5	Developing
0-10	-	-	-	-	-	-	-	-	Beginning
Total	40	100	40	100	40	100	40	100	

Table 1 shows the result of students' performance outcome as to their problem-based learning in explanatory knowledge. It reveals that majority of the students' learning outcome under explanatory knowledge that were exposed to problem-based learning method was at proficient level. However, there were 11 students under explanation problem, nine in fact-finding and seven in strategy problem that fell under outstanding level.

The result indicates that using problem-based learning method they were able to provide sufficient explanations and gave reasons for the scenarios presented to them. It also shows that they can identify and analyze what happened and capable of evaluating what had caused the problem. Furthermore, among the PBL methods that developed the learning outcome under explanatory knowledge, it revealed that the students exposed to explanation problem obtained the highest percentage of 27.5 percentage and 67.5 percentage in outstanding and proficient level, respectively. This implies that the group of students who were exposed to this method were able to establish connections between the concept and statements, which allowed them to provide a better understanding and come-up with the conclusion to solve the problem. Likewise, being exposed to explanation problem encouraged the learners to explain the idea, justify a stand and draw connections to the topic.

1.2. Performance Outcome of Students as to their Problem-Based Learning in Descriptive Knowledge

Table 2
Performance Outcome of Students in Descriptive Knowledge

Scores	Explanation Problem		Fact-Finding Problem		Strategy Problem		Moral Dilemma		Interpretation
	F	%	F	%	F	%	F	%	
31-40	3	7.5	14	35	10	25	-	-	Outstanding
21-30	32	80	24	60	21	52.5	20	50	Proficient
11-20	5	12.5	2	5	9	22.5	20	50	Developing
0-10	-	-	-	-	-	-	-	-	Beginning
Total	40	100	40	100	40	100	40	100	

The table shows the students' performance outcome as to their problem-based learning method in descriptive knowledge. As the table illustrates, the majority of students exposed in PBL obtained scores ranging from 21 to 30 and fell under proficient level. Conversely, there were three students in explanation, 14 in fact-finding and 10 in strategy problem who gained score ranging from 31-40 with outstanding level. The result reveals that being in the proficient level; students were able to develop concrete reasoning that is supported by scientific principles or factual information. They were capable of identifying relationships among the information, thus arriving at correct analysis and conclusions. They were able to provide relevant evidences that will help them draw solution and solve the problem.

Moreover, with the percent distribution of 35 percent in outstanding and 60 percent in proficient level, it shows that the students exposed in fact-finding performed better in improving descriptive knowledge. This implies that students exposed to fact finding problem developed understanding on how to describe ideas and draw conclusions supported by data, investigation and scientific facts.

1.3. Performance Outcome of Students as to their Problem-Based Learning in Procedural Knowledge

Table 3. *Performance Outcome of Students in Procedural Knowledge*

Scores	Explanation Problem		Fact-Finding Problem		Strategy Problem		Moral Dilemma		Interpretation
	F	%	F	%	F	%	F	%	
31-40	4	10	5	12.5	13	32.5	-	-	Outstanding
21-30	29	72.5	28	70	25	62.5	32	80	Proficient
11-20	7	17.5	7	17.5	2	5	8	20	Developing
0-10	-	-	-	-	-	-	-	-	Beginning
Total	40	100	40	100	40	100	40	100	

The table shows the students' performance outcome as to their problem-based learning method in procedural knowledge. It reveals that most of the students' attained scores ranging from 21 to 30, which showed that procedural knowledge

of the students fell under proficient level. However, there were four students exposed in explanation problem, five and 13 students in fact-finding and strategy problem, respectively who obtained outstanding level with score range of 31-40. The result implies that upon the implementation of the study, the students develop sufficient understanding about the concepts and ideas on how to correctly perform the given procedure and accomplished the task to solve the problem. They were able to adequately address the given problem and come up with a suitable conclusion and solution.

Table 3 also illustrates that among PBL method, strategy problem surpasses the others in procedural knowledge with 32.5% at the outstanding level. This implies that students exposed to strategy problem develop ways to understand ideas, carry out strategic plans and follow precise methods and procedures, thus develop an in-depth analysis to arrive with appropriate solution.

1.4. Performance Outcome of Students as to their Problem-Based Learning in Personal Knowledge

Table 4
Performance Outcome of Students in Procedural Knowledge

Scores	Explanation Problem		Fact-Finding Problem		Strategy Problem		Moral Dilemma		Interpretation
	F	%	F	%	F	%	F	%	
31-40	-	-	-	-	1	2.5	4	10	Outstanding
21-30	12	30	12	30	20	50	33	82.5	Proficient
11-20	28	70	28	70	19	47.5	3	7.5	Developing
0-10	-	-	-	-	-	-	-	-	Beginning
Total	40	100	40	100	40	100	40	100	

The table shows the students' performance outcome as to their problem-based learning method in personal knowledge. It reveals that majority of students exposed in PBL method under explanation and fact-finding fell under developing level with frequency of both 28 (70%). However, it also indicates that 20 (50%) and 33 (82.5%) of the students exposed in strategy and moral dilemma, respectively fell under proficient level. It can be inferred that upon the application of PBL method, students developed skills to efficiently interpret the concepts on their own; however, it was also observed that they find it challenging to express their own thoughts and relate the problem with their own experiences. Nonetheless, they were still able to apply their learning and arrived at correct evaluation.

It also reveals that highest percentage distribution among problem-based learning method in personal knowledge was moral dilemma with 82.5 at proficient level. This implies that using moral dilemma, students developed personal understanding to deliver the meaning and interpret its connection to the problem. They established personal connection to the topic with real-life problem scenario giving them confidence to explain

and elaborate things based on their own understanding.

1.5. Performance Outcome of Students as to their Problem-Based Learning

Table 5
Mean Scores of Students Performance Outcome as to their Problem-Based Learning

Problem-Based Learning Method	Explanatory Knowledge		Verbal Interpretation	Descriptive Knowledge		Verbal Interpretation	Procedural Knowledge		Verbal Interpretation	Personal Knowledge		Verbal Interpretation
	Mean	SD		Mean	SD		Mean	SD		Mean	SD	
Explanation Problem	28.35	4.10	P	26.65	3.70	P	25.60	4.13	P	20.95	1.90	P
Fact-finding Problem	26.30	5.11	P	29.25	4.85	P	25.90	4.67	P	20.15	2.47	P
Strategy Problem	25.45	5.18	P	26.15	5.43	P	28.75	4.75	P	22.10	3.55	P
Moral Dilemma	22.80	3.25	P	21.25	2.40	P	24.30	3.57	P	26.95	3.35	P
Overall	25.73	1.99	P	25.83	2.89	P	26.14	1.62	P	22.54	2.64	P

The table shows the students' performance outcome as to their problem-based learning in explanatory, descriptive, procedural and personal knowledge. It reveals that the highest mean score in explanation problem was explanatory knowledge with 28.35. While highest mean scores of fact-finding problems was 29.25 in descriptive knowledge, strategy problem was 28.75 in procedural knowledge and moral dilemma was 26.95 in personal knowledge. Based on the result, it suggests that each PBL method enhances and targets specific learning outcomes. It reveals that students learning outcomes improved more using appropriate problem- based learning method. Students exposed under each specific PBL method established broader application of their skills through activities that encourage problem solving.

The table also shows that the students' performance outcomes as to their problem-based learning were all in the proficient level. This implies that the students were able to use their skills and prior knowledge as they generate new ideas, reasoning and were acquainted with principles to give solution to the problem. This also reveals that they were

aware of their own learning process and were able to construct the essential information for them to better understand the problem and come-up with a precise conclusion.

2. Significant difference in the Students Problem-Based Learning Outcomes when group according to the Teaching Method

2.1. Test of Difference between Students' Problem-Based Learning Outcomes when group according to the Teaching Method

Table 6
Test of Difference in the Students Problem Based Learning Outcomes as to the Teaching Method

Learning Outcome		Sum of Squares	df	Mean Square	F	p-value
Explanatory Knowledge	Between Groups	634.100	3	211.367	10.273	.000
	Within Groups	3209.800	156	20.576		
	Total	3843.900	159			
Descriptive Knowledge	Between Groups	1337.900	3	445.967	24.013	.000
	Within Groups	2897.200	156	18.572		
	Total	4235.100	159			
Procedural Knowledge	Between Groups	421.875	3	140.625	7.404	.000
	Within Groups	2963.100	156	18.994		
	Total	3384.975	159			
Personal Knowledge	Between Groups	1115.275	3	371.758	43.328	.000
	Within Groups	1338.500	156	8.580		
	Total	2453.775	159			

Legend: p<0.05 –Significant

The table shows the difference between students' problem-based learning outcomes when grouped according to the teaching method. It reveals that testing of difference using analysis of variance, the p-values in explanatory, descriptive, procedural and personal knowledge were all equal to 0.000 with F values of 10.273, 24.013, 7.404 and 43.328 correspondingly. These values reveal that the students' learning outcomes, when grouped according to the PBL method, were significantly different to each other. This significant difference was attributed to the problem-based learning method that is most suited and appropriate to target specific result of the study, indicating that each problem-based learning method develops specific learning outcomes as shown in Table 5. It targets and enhances specific skills and knowledge that led in the improvement of students' scientific proficiency. The result implies that when explanation problem was used, it improves explanatory knowledge, likewise when fact finding was implemented, it enriches descriptive knowledge, and for strategy problem and moral dilemma, it develops procedural and personal knowledge, respectively. This suggests that when implementing PBL, the teacher can choose learning skills that they wanted to develop for their students

2.2. Multiple Comparisons between Students' Problem-Based Learning in Explanatory Knowledge

Table 7

Multiple Comparisons between Students' Problem-Based Learning in Explanatory Knowledge

DV	Problem-Based Learning (Factor)		Mean Difference	Std. Error	p-value	95% Confidence Interval		Interpretation
						Lower Bound	Upper Bound	
Explanatory Knowledge	Explanation Problem	Fact-finding Problem	2.050	1.014	.185	-.58	4.68	Not Significant
		Strategy Problem	2.900*	1.014	.025	.27	5.53	Significant
		Moral Dilemma	5.550*	1.014	.000	2.92	8.18	Significant
	Fact-finding Problem	Explanation Problem	-2.050	1.014	.185	-4.68	.58	Not Significant
		Strategy Problem	.850	1.014	.836	-1.78	3.48	Not Significant
		Moral Dilemma	3.500*	1.014	.004	.87	6.13	Significant
	Strategy Problem	Explanation Problem	-2.900*	1.014	.025	-5.53	-.27	Significant
		Fact-finding Problem	-.850	1.014	.836	-3.48	1.78	Not Significant
		Moral Dilemma	2.650*	1.014	.048	.02	5.28	Significant
	Moral Dilemma	Explanation Problem	-5.550*	1.014	.000	-8.18	-2.92	Significant
		Fact-finding Problem	-3.500*	1.014	.004	-6.13	-.87	Significant
		Strategy Problem	-2.650*	1.014	.048	-5.28	-.02	Significant

Legend: p<0.05 –Significant

The table presents the multiple comparisons between students' problem-based learning in explanatory knowledge. It reveals that explanation and fact-finding problem were not significantly different to each other, with the mean difference of 2.050 and p-value of 0.185. Same result also shows between fact-finding and strategy problem with the mean difference of 0.850 and 0.836 as p-value. Contrary, the other remaining PBL shows significant difference to each other. The result can be attributed to the fact that explanation problem, fact finding problem and strategy problem improve and develop students' analysis and synthesis.

The multiple comparisons also indicate that, among PBL method, explanation problem is the most effective learning method in enriching explanatory knowledge. This further implies that students develop knowledge on how to explain the concepts and principles by giving reasons for it. On the other hand, the result also reveals that fact finding and strategy problem can also be used as an alternative method in improving this learning outcome.

2.3. Multiple Comparisons between Students' Problem-Based Learning in Descriptive Knowledge

Table 8
Multiple Comparisons between Students' Problem-Based Learning in Descriptive Knowledge

DV	Problem-Based Learning (Factor)		Mean Difference	Std. Error	Sig.	95% Confidence Interval		Interpretation
						Lower Bound	Upper Bound	
Descriptive Knowledge	Explanation Problem	Fact-finding Problem	-2.600*	.964	.038	-5.10	-.10	Significant
		Strategy Problem	.500	.964	.954	-2.00	3.00	Not Significant
		Moral Dilemma	5.400*	.964	.000	2.90	7.90	Significant
	Fact-finding Problem	Explanation Problem	2.600*	.964	.038	.10	5.10	Significant
		Strategy Problem	3.100*	.964	.008	.60	5.60	Significant
		Moral Dilemma	8.000*	.964	.000	5.50	10.50	Significant
	Strategy Problem	Explanation Problem	-.500	.964	.954	-3.00	2.00	Not Significant
		Fact-finding Problem	-3.100*	.964	.008	-5.60	-.60	Significant
		Moral Dilemma	4.900*	.964	.000	2.40	7.40	Significant
	Moral Dilemma	Explanation Problem	-5.400*	.964	.000	-7.90	-2.90	Significant
		Fact-finding Problem	-8.000*	.964	.000	-10.50	-5.50	Significant
		Strategy Problem	-4.900*	.964	.000	-7.40	-2.40	Significant

Legend: p<0.05 –Significant

The table presents the multiple comparisons between students' problem-based learning in descriptive knowledge. It reveals that explanation and strategy problem were not significantly different to each other with mean difference of 0.500 and p-value of 0.954. However, it reveals that most of the PBL method was significantly different to each other. The result can be attributed and supported by the problem-based learning taxonomy presented by Peter (2009) where it was shown that both explanation and strategy problem develop students' analysis, synthesis and evaluation.

Multiple comparisons also show that fact finding problem is the most appropriate learning method for improving descriptive knowledge.

2.4. Multiple Comparisons between Students' Problem-Based Learning in Procedural Knowledge

Table 9
Multiple Comparisons between Students' Problem-Based Learning in Procedural Knowledge

DV	Problem-Based Learning (Factor)		Mean Difference	Std. Error	Sig.	95% Confidence Interval		Interpretation
						Lower Bound	Upper Bound	
Procedural Knowledge	Explanation Problem	Fact-finding Problem	-.300	.975	.990	-2.83	2.23	Not Significant
		Strategy Problem	-3.150*	.975	.008	-5.68	-.62	Significant
		Moral Dilemma	1.300	.975	.543	-1.23	3.83	Not Significant
	Fact-finding Problem	Explanation Problem	.300	.975	.990	-2.23	2.83	Not Significant
		Strategy Problem	-2.850*	.975	.020	-5.38	-.32	Significant
		Moral Dilemma	1.600	.975	.358	-.93	4.13	Not Significant
	Strategy Problem	Explanation Problem	3.150*	.975	.008	.62	5.68	Significant
		Fact-finding Problem	2.850*	.975	.020	.32	5.38	Significant
		Moral Dilemma	4.450*	.975	.000	1.92	6.98	Significant
	Moral Dilemma	Explanation Problem	-1.300	.975	.543	-3.83	1.23	Not Significant
		Fact-finding Problem	-1.600	.975	.358	-4.13	.93	Not Significant
		Strategy Problem	-4.450*	.975	.000	-6.98	-1.92	Significant

Legend: p<0.05 –Significant

Table 9 presents the multiple comparisons between students' problem-based learning in procedural knowledge. It indicates that in terms of procedural knowledge, explanation problem, fact-finding problem and moral dilemma were not significantly different to each other. On the other hand, explanation problem, fact-finding problem and moral dilemma were significantly different to strategy problem.

Based on the result, the significant difference can be inferred that the most effective problem-based learning method in improving procedural knowledge is strategy problem. In the actual study, it was observed that solving strategy problem enhanced students understanding of the underlying concepts and helped them implement correct procedures on how to formulate suitable conclusion. Students developed skills that helped them execute actions to find solution to the problem. They gathered data and used their prior knowledge to the problem and concepts unfamiliar to them to support the generation of new knowledge. This substantiates the study conducted by Ling et al. (2019) which reveals that problem-solving strategy has significantly developed students' procedural knowledge.

2.5. Multiple Comparisons between Students' Problem-Based Learning in Personal Knowledge

Table 10
Multiple Comparisons between Students' Problem-Based Learning in Personal Knowledge

DV	Problem-Based Learning (Factor)		Mean Difference	Std. Error	Sig.	95% Confidence Interval		Interpretation
						Lower Bound	Upper Bound	
Personal Knowledge	Explanation Problem	Fact-finding Problem	.800	.655	.614	-.90	2.50	Not Significant
		Strategy Problem	-1.150	.655	.299	-2.85	.55	Not Significant
		Moral Dilemma	-6.000*	.655	.000	-7.70	-4.30	Significant
	Fact-finding Problem	Explanation Problem	-.800	.655	.614	-2.50	.90	Not Significant
		Strategy Problem	-1.950*	.655	.018	-3.65	-.25	Significant
		Moral Dilemma	-6.800*	.655	.000	-8.50	-5.10	Significant
	Strategy Problem	Explanation Problem	1.150	.655	.299	-.55	2.85	Not Significant
		Fact-finding Problem	1.950*	.655	.018	.25	3.65	Significant
		Moral Dilemma	-4.850*	.655	.000	-6.55	-3.15	Significant
	Moral Dilemma	Explanation Problem	6.000*	.655	.000	4.30	7.70	Significant
		Fact-finding Problem	6.800*	.655	.000	5.10	8.50	Significant
		Strategy Problem	4.850*	.655	.000	3.15	6.55	Significant

Legend: p<0.05 –Significant

Table 10 presents the multiple comparisons between students' problem-based learning in personal knowledge. It shows that explanation problem to fact-finding and strategy problem were the only comparisons that were not significantly different to each other with 0.614 and 0.299 p-values and mean difference of 0.800 and -1.150 respectively. Contrary, the rest of the comparisons among PBL were significantly different to each other. The result can be attributed to the fact that explanation, fact finding and strategy problem all focused in developing students' analysis and synthesis. On the other hand, it reveals that moral dilemma was significantly different to the other PBL method. It also indicates that this PBL method was the most effective in improving personal knowledge. It can be inferred that after utilizing this method, the students developed greater engagement to the topic because they can easily relate it in their own experiences.

CONCLUSIONS

Based on the data gathered, the following conclusions are drawn:

1. The students' performance outcome as to their problem-based learning in terms of explanatory knowledge, descriptive knowledge, procedural knowledge and personal knowledge fall under the category of proficient level.
2. There is a significant difference in the students' problem-based learning outcomes when grouped according to the teaching method as to explanation problem, fact-finding problem, strategy problem and moral dilemma. Thus, the posited hypothesis is not sustained.

RECOMMENDATIONS

Based on the findings and conclusion of this study, the following recommendations are offered:

1. It is suggested that to attain the target learning outcomes, appropriate problem-based learning method may use such as explanation problem to explanatory knowledge, fact finding problem to descriptive knowledge, strategy problem to procedural knowledge and moral dilemma to personal knowledge.
2. Since the researcher used printed modular distance learning in implementing the lesson, teachers may look for another strategy or blended learning in executing problem-based learning method to improve students learning outcomes especially during this time of pandemic.
3. School department heads may tackle problem-based learning in seminar-workshops, in-service training, and other training programs for teachers which may enrich their expertise in delivering instruction that will lead to high classroom performance.
4. Future researchers may conduct similar study for a wider scope, in a longer span of time and in other learning areas or subjects.

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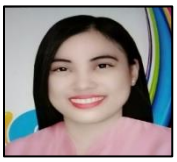
AUTHORS' PROFILE



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