

## COMPETENCY – BASED LEARNING ASSESSMENT AND LEARNERS’ SCIENTIFIC LITERACY

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### ABSTRACT

*The study focused to determine the competency-based learning assessment and the scientific literacy knowledge skills of the Grade 9 students of Silangang Malicboy National High School. There were 187 Grade 9 students in the said school. Three sections out of five sections of Grade 9 were tapped as respondents of the study. Each group consisted of 40 students. The first group was exposed to the proficiency-based while the second group used mastery-based and the third group the outcome-based. The researcher made lesson plan wherein the different competency-based learning assessments were attached. This assessment tool was used by the different groups to develop and enhance their scientific literacy knowledge skills. The lesson plan with 40 items pre and post assessments and the checklist questionnaires were validated by the master teachers, research adviser and panelists. The study employed the experimental design using the pretest – posttest. The performance of Grade 9 students in the pre-assessment as to their scientific literacy knowledge skills such as critical thinking and decision-making fell under “Approaching Proficiency” level while in the investigative skills and problem solving, most students were under the “Beginning” level. On the other hand, when the students used the competency-based learning assessment, their performance improved and developed which was supported by the result of their post assessment under the “Advanced” level. Result also indicates that there was a significant difference in the performance of the students in pre and post assessments when they were exposed to the competency-based learning assessment as to critical thinking, investigative skills, problem solving and decision-making. This reveals that using the said assessment tool, it can enhance the scientific literacy knowledge skills of the students.*

**Keywords:** *Competency-based Learning Assessment, Scientific Literacy Skills, Proficiency based, Mastery based, Outcome based*

### INTRODUCTION

In the Philippine setting, education remains the top priority. Regardless of the different plans and projects made by the government and different sectors of education, the quality of Philippine education still leaves much room for development.

The Philippine Educational Curriculum provides various challenges on the teaching – learning modes considering the revision of the curriculum and the programs for each subject.

Science education, as one of the key components of the K to 12 Enhanced Basic Education Program, has faced with a number of challenges relative to the achievement of the target competencies (Borres, 2015).

The K to 12 Basic Education Curriculum stated in the conceptual framework, the science education aims to develop scientific literacy among learners that will prepare them to be informed and participative citizens who are able to make judgments and decisions regarding

applications of scientific knowledge that may have social, health, or environmental impacts.

It is very important to measure the level of competence of the students after the delivery of lesson to ensure that the students understand the concepts. Assessment is one of the methods that can be used to measure the level of competence of the students. The process of student assessment should align with curricular goals and educational objectives (Soland et al., 2013).

In the same manner, according to DepEd Order No. 8 Series of 2015, teachers should provide appropriate assessment when they aim to holistically measure learners' current and developing abilities. This view recognizes the diversity of learners and need for multiple ways of measuring their varying abilities and learning potentials.

The researcher is in the process of looking for an effective measure to enrich students' understanding on the competencies. Thus, this research concerned mainly on competency-based learning system and learner's scientific literacy skills in Science 9.

## OBJECTIVES OF THE STUDY

This study was conducted to: 1) determine on how students perceived the effectiveness of the competence-based learning assessments as to: proficiency based, mastery based and outcome based; 2) describe the performance of Grade 9 Science students in the pre and post assessments as to their scientific literacy skills such as critical thinking, investigative skills, problem solving and decision making; and 3) the significance difference in the performance of Grade 9 Science students in pre and post assessment when exposed to the competency based learning assessment.

## METHODOLOGY

This study employed experimental design of research using the pretest – posttest design. There were three groups of Grade 9 who were subjected to the different

competency-based learning system desired outcomes. One group used the mastery based, the other one utilized the proficiency based and the last one was assessed by outcome based.

The 120 respondents of the study were purposively chosen because Silangang Malicboy National High School is only school in Barangay Silangang Malicboy, Pagbilao, Quezon and continuously provides appropriate learning and assessment tools for the students to improve their level of competence.

For the level of validity of the assessment tool, the researcher asked assistance from the six Science teachers from SMNHS (2 teachers), Pagbilao Grande Island National High School (1 teacher), and Paaralang Sekundarya ng Lucban (3 teachers) and one Public School District Supervisor who served as the validators.

A researcher made pre and posttest was constructed to determine the scientific literacy of the students in the topics in Physics. The data gathered were subjected to different statistical measures and tools to help the researcher to present, analyze, and interpret the data gathered. The frequency, mean percentage score and t-test were used as the statistical tools of this study.

## RESULTS AND DISCUSSION

### 1. Students Competency-based Learning Assessment

#### 1.1 Students Competency-based Learning Assessment in terms of Proficiency-based

Table 1 shows the mean of students' perception on the effectiveness of the competency-based learning assessment as to proficiency-based. The average mean of 3.87 was computed for students' perception towards the effectiveness of the competency-based learning assessment and interpreted as "Effective."



Students enjoyed doing the different activities or tasks given to them with their groupmates.

**Table 1**  
*Effectiveness of the competency-based learning assessment as to Proficiency-based*

Indicators	Mean	VI
1. The activities are specific, clear, attainable and measurable.	4.00	E
2. The activities help me develop my higher order thinking skills.	4.15	E
3. It is applicable to real – life situation.	3.58	E
4. It allows to improve my ability to design procedures and to collect, analyze and interpret data.	3.75	E
5. It allows me to apply my scientific knowledge into actions.	3.85	E
<b>Overall</b>	<b>3.87</b>	<b>Effective</b>

They answered the guide questions correctly especially how to convert different measurements. They also perceived that proficiency-based helped them improved their ability to analyze and interpret data.

It was supported by the viewpoint of Pace (2014), where proficiency-based learning is designed to identify and address gaps in order to provide equitable learning opportunities for each and every student.

### 1.2 Students Competency-based Learning Assessment in terms of Mastery-based

Table 2 shows mean of the students' perception on the effectiveness of the competency-based learning assessment as to mastery-based in which the students answered "Effective" based in the overall mean of 3.51. This data imply that the students know the importance of mastery of problem-solving skills. Students answered the different problem-solving items given to them with complete information and proper way of solving them.

**Table 2**  
*Effectiveness of the competency – based learning assessment as to Mastery – Based*

Indicators	Mean	VI
1. It allows me to solve problems efficiently and accurately.	3.53	E
2. It assists me to acquire better problem-solving skills.	3.50	E
3. It provides me to think critically and analytically.	3.43	E
4. It helps me to attain mastery in problem solving of various applications.	3.58	E
5. It gives me the opportunity to investigate a certain problem.	3.53	E
<b>Overall</b>	<b>3.51</b>	<b>Effective</b>

From this, it can be inferred that students thought critically and analytically. According to Ellis (2019), teachers should determine the type of learning does the student have to know and what kind of assessment will be used.

### 1.3 Students Competency-Based Learning Assessment in terms of Outcome-Based

**Table 3**  
*Effectiveness of the competency-based learning assessment as to Outcome-Based*

Indicators	Mean	VI
1. It integrates and develops my communicative skills among others.	3.80	E
2. It gives me opportunity to develop my scientific literacy skills.	3.83	E
3. It helps me apply my understanding on real life contexts.	3.55	E
4. It contains tools and measures to demonstrate what I have learned well.	3.78	E
5. It strengthens my skills to meet the context standard.	3.80	E
<b>Overall</b>	<b>3.75</b>	<b>Effective</b>



Table 3 indicates the mean of the students' perception on the effectiveness of the competency-based learning assessment as to outcome-based that students responded "Effective" with overall mean of 3.75. Students were exposed to the different assessment characterized under outcome-based. They found that the activities given to them were enjoyable and meaningful especially in the lesson of momentum. According to Suvin (2018), outcome-based assess the student's

performance and knowledge that matches with the 21<sup>st</sup> century skills and values every single outcome of them.

**2. Performance of Grade 9 Science students in the pre and post assessment.**

**2.1 Students' Pre and Post Assessment Performance in Terms of Critical Thinking**

**Table 4**  
*Pre and Post Assessment Performance as to Critical Thinking*

Performance	Proficiency Based				Mastery Based				Outcome Based			
	Pre -		Post		Pre -		Post		Pre -		Post	
	F	%	F	%	F	%	F	%	F	%	F	%
<b>90 and above</b> (Advanced)	0	0	25	62.5	0	0	25	62.5	0	0	22	55
<b>85 - 89</b> (Proficient)	2	5	12	30	0	0	6	15	0	0	8	20
<b>80 - 84</b> (Approaching Proficiency)	21	52.5	3	7.5	8	20	9	22.5	6	15	9	22.5
<b>75 - 79</b> (Developing)	8	20	0	0	6	15	0	0	10	25	1	2.5
<b>Below 75</b> (Beginning)	9	22.5	0	0	26	65	0	0	24	60	0	0
<b>Total</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>

Table 4 reveals the students' pre and post assessment performance as to critical thinking. As shown in the results, most of the scores of the students in pre-assessment in proficiency based fell under 80-84 with a percent distribution of 52.5 and categorized as "Approaching Proficiency" level. However, most of the students under mastery and outcome based belonged to the "Beginning" level with 65 and 60 percent distribution.

As the result obtained from the pre-assessment, the students found it hard to answer the critical thinking questions with regard to the Physics topics. Since they were not familiar to the concepts and terms used in Physics, they fell under the "Beginning" level for the mastery based and outcome based. They had a problem in analyzing the questions. Though proficiency based was in the "Approaching Proficiency" level still, they need to develop their critical thinking

skills for them to improve their knowledge and skills on how to understand the concept in Physics.

In post assessment, it showed that most of the students in proficiency based, mastery based and outcome based got 90 and above which interpreted as "Advanced" level.

This indicates that students developed their critical thinking with the use of competency-based learning assessment such as proficiency, mastery and outcome-based. Students understood the questions especially in the uniformly accelerated motion and projectile motion. They answered the questions correctly using the assessment.

Its results were in line with Bensley's (2011), that assessment of student learning outcomes can be a powerful tool for improvement of instruction when a scientific approach is take



### 2.2 Students' Pre and Post Assessment Performance as to Investigative Skills

**Table 5**  
*Pre and Post Assessment Performance as to Investigative Skills*

Performance	Proficiency Based				Mastery Based				Outcome Based			
	Pre -		Post		Pre -		Post		Pre -		Post	
	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment
	F	%	F	%	F	%	F	%	F	%	F	%
<b>90 and above</b> (Advanced)	0	0	35	87.5	0	0	30	75	0	0	20	50
<b>85 - 89</b> (Proficient)	1	2.5	4	10	0	0	7	17.5	1	2.5	13	32.5
<b>80 - 84</b> (Approaching Proficiency)	5	12.5	1	2.5	4	10	3	7.5	6	15	7	17.5
<b>75 - 79</b> (Developing)	6	15	0	0	11	27.5	0	0	6	15	0	0
<b>Below 75</b> (Beginning)	28	70	0	0	25	62.5	0	0	27	67.5	0	0
<b>Total</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>

Table 5 shows the students' pre and post assessment performance as to investigative skills. It reveals that most of the students in pre – assessment under proficiency, mastery and outcome based got below 75 with percent distribution of 70, 62.5 and 67.5 which corresponds to the “Beginning” level. The result indicates that students in each group had the same level of investigative skills before they were subjected to the treatment of the study.

It reveals that investigative skills needed to be developed among the students. Only few understood the questions and found it difficult due to the topics in Physics. Most of them got the wrong answer due to lack of investigative skills

needed to answer and solve a problem. As such, most of the students got 90 and above which was interpreted as “Advanced” level in post assessment. This data reveals that they enhanced their investigative skills when exposed to the competency-based learning assessment. Students applied what they have learned from the activities given to them. They followed and applied the science process skills in order to answer the questions correctly. They were exposed to the different assessment that helped them to develop their investigative skills. It was supported by Mooed (2013), citing that learning science through investigation is promoted as a preferred pedagogical approach.

### 2.3 Students' Pre and Post Assessment Performance as to Problem Solving

**Table 6**  
*Pre and Post Assessment Performance as to Problem Solving*

Performance	Proficiency Based				Mastery Based				Outcome Based			
	Pre -		Post		Pre -		Post		Pre -		Post	
	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment	Assessment
	F	%	F	%	F	%	F	%	F	%	F	%
<b>90 and above</b> (Advanced)	1	2.5	29	72.5	0	0	29	72.5	0	0	24	60
<b>85 - 89</b> (Proficient)	2	5	7	17.5	0	0	3	7.5	0	0	11	27.5
<b>80 - 84</b> (Approaching Proficiency)	6	15	4	10	4	10	7	17.5	7	17.5	5	12.5
<b>75 - 79</b> (Developing)	6	15	0	0	7	17.5	0	0	3	7.5	0	0
<b>Below 75</b> (Beginning)	25	62.5	0	0	29	72.5	1	2.5	30	75	0	0
<b>Total</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>



Table 6 shows the students' pre and post assessment performance as to problem solving. It shows that most of the students in pre – assessment got 75 which corresponds to the “Beginning” level. They got percent distribution of 62.5 in proficiency, 72.5 in mastery and 75 in outcome based.

The result shows that most of the students had difficulty in answering problem solving. It is true that in solving physics problems, they should first analyze, interpret and visualize the question to answer it correctly. But since they were not

familiar in the formula, they did not probably solve it properly.

In post assessment, most students under proficiency based, mastery based and outcome based got 90 and above with 72.9, 72.5 and 60 percent distribution respectively which lies on “Advanced” level. It reveals that students developed their problem-solving skills with the use of competency-based learning assessment with or without the guidance of the teacher by understanding, analyzing, interpreting, and thinking critically the problems. Students apply what they have learned in solving the problems

## 2. 4 Students' Pre and Post Assessment Performance as to Decision Making

**Table 7**  
*Pre and Post Assessment Performance as to Decision Making*

Performance	Proficiency Based				Mastery Based				Outcome Based			
	Pre - Assessment		Post Assessment		Pre - Assessment		Post Assessment		Pre - Assessment		Post Assessment	
	F	%	F	%	F	%	F	%	F	%	F	%
90 and above (Advanced)	2	5	26	65	1	2.5	34	85	2	5	39	97.5
85 - 89 (Proficient)	4	10	9	22.5	1	2.5	5	12.5	1	2.5	0	0
80 - 84 (Approaching Proficiency)	19	47.5	5	12.5	11	27.5	1	2.5	8	20	0	0
75 - 79 (Developing)	11	27.5	0	0	11	27.5	0	0	8	20	1	2.5
Below 75 (Beginning)	4	10	0	0	16	40	0	0	21	52.5	0	0
<b>Total</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>	<b>40</b>	<b>100</b>

Table 7 shows the students' pre and post assessment performance as to problem solving. In pre-assessment, most of the students got 80-84 with 47.5 percent distribution which interpreted as “Approaching Proficiency” level in proficiency based. However, most students in mastery and outcome-based falls under below 75 with 40 percent distribution and 52.5 percent distribution which is interpreted as to “Beginning” level.

The results reveal that students need to pay attention in making decision to their everyday life. Students find it difficult to choose or make a right decision in answering the questions in momentum and projectile motion. Since decision-making is a process of making choices, students should know how to identify a decision, gather information, and assess alternative resolutions

Most of the students in proficiency, mastery and outcome based got 90 and above

with 72.5, 72.5 and 60 percent distribution respectively corresponding to “Advanced” level in post assessment.

It reveals that students know how to make decision wisely when they exposed to the competency-based learning assessment. After doing the tasks given to them, they will now think of carefully deciding. They eliminated the choices they knew was wrong and chose the best answer especially in momentum as according to Soland, et al. (2013) it is very important to measure the level of competence of the students after the delivery of lesson to ensure that the students understand the concepts. Assessment is one of the methods that can be used to measure the level of competence of the students.



**3. Test of Students Assessment when Exposed to the Competency – Based Learning Assessment as to their Scientific Literacy Skills**

**Table 8**  
*Test of Assessment Performance in Critical Thinking of Students*

Competency Based Learning Assessment	Pretest		Posttest		Mean Difference	SD	95% Confidence Interval of the Difference		t	df	214
	M	SD	M	SD			Upper	Lower			
	Proficiency Based	78.30	6.20	91.50			4.10	-13.20			
Mastery Based	72.50	6.22	91.10	6.04	-18.60	7.39	-15.84	-21.36	-13.65	39	0.000
Outcome Based	72.20	5.20	89.60	5.42	-17.40	8.62	-15.04	-19.76	-14.90	39	0.000

Table 8 shows the test of assessment in critical thinking of students. Based on the table, the t – value of proficiency based, mastery based and outcome based are -11.16, - 13.65, and - 14.90 respectively. It shown that there is a significant difference between the performance of the students in pre and post assessment.

The result reveals that three-competency learning assessment are effective in enhancing

the critical thinking skills of the students. This result was based on the students’ active participation in the lesson. There were activities that needs them to work in group which they can have brainstorming about a certain problem they need to solve. They were also eager to discuss their work among the class. They answered and did the tasks given to them accordingly to what the rubrics have.

**Table 9**  
*Test of Assessment in Investigative Skills of Students*

Competency Based Assessment	Pretest		Posttest		Mean Difference	SD	95% Confidence Interval of the Difference		t	df	Sig. (2 - tailed)
	M	SD	M	SD			Upper	Lower			
	Proficiency Based	72.60	6.05	94.50			4.22	-21.90			
Mastery Based	71.60	5.19	92.60	5.09	-21.00	7.57	-18.58	-23.42	-17.56	39	0.000
Outcome Based	72.60	6.05	94.50	4.22	-17.80	9.37	-14.80	-20.80	-12.02	39	0.000

Table 9 shows the test assessment in investigative skills of students. It reveals that there was a significant difference in the performance of the students in pre and post assessment when exposed to competency-based learning assessment. Based on the table, the t-value of proficiency based, mastery based

and outcome based are -19.27, - 17.56, and - 12.02 respectively.

The result on the above table indicate that with the use of competency-based learning assessment students developed and improved their investigative skills. This is due to the fact that students are participating in the group activities.

**Table 10**  
*Test of Assessment in Problem Solving of Students*

Competency Based Assessment	Pretest		Posttest		Mean Difference	SD	95% Confidence Interval of the Difference		t	df	Sig. (2 - tailed)
	M	SD	M	SD			Upper	Lower			
	Proficiency Based	73.00	7.62	91.90			4.66	-18.90			
Mastery Based	71.30	5.27	94.30	8.05	-23.00	11.30	-19.38	-26.62	-12.87	39	0.000
Outcome Based	70.90	5.80	91.00	5.02	-20.10	7.55	-17.69	-22.51	-16.84	39	0.000

Table 10 shows the test of assessment in problem solving of students. It reveals that the t-



value of proficiency based is -14.15, mastery based is -12.87 and outcome based is -16.84. It shows that there is a significant difference on the performance of the students in pre and post assessment when exposed to competency-based learning assessment.

It shows that students enhance their problem-solving skills using the assessment. They determined first the problem, wrote the

given and the required then analyzed what formula they will use to answer the problem. Using the process on how to solve the problem, they answered the problem with correct unit of measurement.

Saygili (2017) cited that problem solving requires a process on how to solve a problem. Student should address the root cause of a problem and thinks a best solution to solve it.

**Table 11**  
*Test of Assessment in Decision Making of Students*

Competency Based Learning Assessment	Pretest		Posttest		Mean Difference	SD	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
	M	SD	M	SD			Upper	Lower			
	Proficiency Based	78.30	6.20	91.50			4.07	-13.20			
Mastery Based	72.50	6.22	91.10	6.04	-18.60	7.39	-15.84	-21.36	-13.65	39	0.000
Outcome Based	72.20	5.20	89.60	5.42	-17.40	8.62	-15.04	-19.76	-14.89	39	0.000

Table 11 shows the test of assessment in decision making of students.

Based in the t-value showed in the table there are significant difference on the performance of students in pre and post assessment since the t-value of proficiency based is -11.16, mastery based is -13.65 and outcome based is -14.90.

It shows that the assessment tool can help the students develop and improve their decision-making skills. Working in small group can help the students to decide wisely. Students analyzed the given situation or problem first then write the possible solution. After that, they choose the best one to answer the problem. Also, they eliminate what they think is not the right answer to lessen the choices they have.

Winterfeldt (2013) said that all decisions, whether they are personal, public, or business-related, are based on the decision maker's beliefs and values. Science can and should help decision makers by shaping their beliefs.

**CONCLUSIONS**

Based on the discussions and interpretation of data, the following are derived conclusion:

1. The performance of Grade 9 students in the pre-assessment as to their scientific literacy skills such as critical thinking and decision-making falls under "Approaching Proficiency" level, while in the investigative skills and problem solving, mostly students are in the "Beginning" level. On the other hand, when students used the competency-based learning assessment, they improve their performance which is supported by the result of their post assessment that lies on the "Advanced" level.

2. The result indicates that there is a significant difference in the performance of Grade 9 students in pre and post assessment when exposed to the competency-based learning assessment as to critical thinking, investigative skills, problem solving and decision making.

**RECOMMENDATIONS**

Based on the findings and conclusions, the researchers formulate the following recommendations:

1. Teachers are encouraged to use the competency-based learning assessment to better improve the students' knowledge and skills on the



different concepts provided in the Science 9 Curriculum with reference on the different hands-on activities and assessment tool.

2. Teachers may utilize the competency – based learning assessment in teaching different concepts in other subject areas to better enhance the level of competence of the students.

3. School Administration may enhance the teaching skills of the teachers by applying them in the actual classroom setting since students' have their own learning styles.

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