ENHANCING SCIENTIFIC LITERACY OF GRADE 9 STUDENTS USING MELCS-BASED SCIENCE DICTIONARY

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ABSTRACT

Science is a broad area of various topics and concepts that often feared by students. Since the subject incorporates technical and unfamiliar terms additional effort is required from teachers to help students comprehend the topics. Vocabulary in teaching science is necessary to let students understand and appreciate the topics being discussed inside the classroom. Assessment data from Programme for International Student Assessment (PISA) on 2018 and quarterly examination scores from the previous school year presents that students score low on average in science subjects. Additionally, literature provided that learners who are subjected to specialized program in building science vocabulary score better than students in the regular learning instruction. Thus, this study focused on crafting science dictionary that is aligned in the most essential learning competencies (MELC) prescribed by the Department of Education (DepEd) for the K-12 Curriculum. Data proved that delivering instructions with the use of the crafted science dictionary, participants' scores improved significantly. Furthermore, the researchers highly suggest the use of guided learning resources such as dictionary and specialized handouts during classroom discussions to help students comprehend the topic quicker.

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INTRODUCTION

Science, in general, is both a subject and a process. The Australian Academy of Science defined the term as a body of knowledge also as a process of acquiring knowledge. With these, to fully understand science – as a subject and as a process – it is required to have observation and conversation. To have meaningful observation and conversation, learners are to use terms or words that are specific to certain subjects, in this case, scientific terms. Since the introduction of K to 12 Basic Education Curriculum in the Philippines, learners as early as Grade 3 are already subjected to different scientific terms being discussed during the four (4) main branches of Natural Science: Matter, Living Things and Their Environment, Force and Motion, and Earth and Space (K-12 Curriculum Guide: SCIENCE, 2016).

The Programme for International Student Assessment (PISA) on 2018 released a result showing that the learners from Philippines scored lower than the average score presented by the Organization for Economic Cooperation and Development (OECD) in reading, mathematics, and science with a mean score of 340, 353, and 357 respectively. Additionally, PISA 2018 findings suggests that more than 80% of students in the Philippines did not meet the minimum proficiency level of reading.

In 2021, Orman et al. presented a result of their study that using a specialized program that focuses on building science vocabulary of learners yields greater results. According to their study, participants who are subjected to specialized science vocabulary instruction outperformed students who are taught in a regular classroom instruction. In addition to this, it is proved that students answer far more questions and improved their quality of answers when there are increase in the understanding in science vocabulary as they can recognize keywords present in the examination (Markwick, 2020).

Looking into the academic performances of Grade 9 students from Biñan Secondary School of Applied Academics (BSSAA) for the past two (2) quarters of S.Y. 2022-2023, 64.88% of students scored lower than 30 in a 40-item examination and 89.20% during the 1st Quarterly Examination (Biology) and 2nd Quarterly Examination respectively. The researchers believe that one of the factors that affect the low mean scores of Grade 9 students during the 1st and 2nd Quarterly examination is due to their poor scientific literacy. Test questionnaires, textbooks, and self-learning modules tend to use technical and scientific terms that might be unfamiliar for the students.

To address the problems arising due to unfamiliarity of Grade 9 students in various scientific terms, this study implemented the use of crafted MELCs-based science dictionary for select Grade 9 students of Biñan Secondary School of Applied Academics.

METHODOLOGY

This research employed a quantitative research design that analyzes test scores of select Grade 9 students of BSSAA. This study is conducted using two class groups, Group A is the control group and Group B is the experimental group in which the dictionary is implemented.

The researchers crafted a specialized science dictionary for the topic photosynthesis and cellular respiration and compared the pre- and post-test scores of Groups A and Group B, post-test scores of Group A to Group B, and gained scores of Group A to Group B. The dictionary crafted by the researchers for the study was aimed to be used for week 7 and 8 during the First Quarter of S.Y. 2023-2024. The concepts included in the dictionary are based on the MELC of the specified week.

The study undergoes four stages to report a viable result: (1) Crafting of questionnaires and the science dictionary, (2) validation, revision, and reproduction of the dictionary and test questionnaires, (3) administration of pre-test and post-tests and implementation of the science dictionary in

the select Grade 9 participants, and (4) analysis and reporting of the gathered test scores from pre- and post-tests of the participating learners.

Crafting of materials

The first stage is the crafting and reproduction of the specialized science dictionary, pre-tests, and post-tests. The researchers included various concepts and terms that are being used during the discussion of the topic photosynthesis and cellular respiration.

Validation, revision, and reproduction

Next, the researchers proceeded to the validation of the questionnaires and the dictionary with the three experts on the field of Science, English, and Filipino. Depending on the recommendations of the three validators, the tools and questionnaires were revised accordingly before implementation and distribution.

Administration and implementation

After receiving the validated and revised dictionary and test questionnaires the researchers administer the pre-test for the select participants before Week 7 starts and distributed the crafted specialized science dictionary after the administration of the pre-test. Then, the participants are given the post-tests on the last day of Week 8 of the first quarter.

Analysis and reporting

Lastly, the researchers reported the findings after the analysis of the test scores of the participants using paired t-test for pre-test scores and post-test scores within the groups and independent t-test to compare the test scores of different groups.

RESULTS

The scientific literacy of the sample participants of Grade 9 students of BSSAA shows low achievement during the pre-test of the study. Looking at the mean scores of both groups, the participants reflected a mean score of 7.53 and 5.93 out of 20 items for pre-test of the control and the experimental

groups respectively. This indicates that participants who took the test has low understanding of what is being included in the test. Tables 1 and 2 shows the improvement of both groups after the administration of the post-test.

Comparison of the test scores made returned positive feedback regarding the result of the study. Table 1 and Table 2 below present that there is a statistical difference between the pre- and post-test scores within the groups of select participants.

Table 2 also revealed that scores of experimental group (Group B) from pre- and post-tests have extremely significant difference. This imply that there is a greater improvement in the experimental group than in the control group. Looking at the mean scores, Group B returned a higher mean score of 14.80 in their post-tests than in the control group with 11.27.

Table 1. Pre and post test scores of Grade 9 students under control group.

	Pre-test	Post-test
Mean	7.53	11.27
Variance	6.53	7.72
Observations	30	30
df	29	
t-calculated	6.703	
p-value	0.000000236	
t-critical	2.045	

Table 2. Pre and post test scores of Grade 9 students under experimental group.

	Pre-test	Post-test
Mean	5.93	14.80
Variance	8.13	5.75
Observations	30	30
df	29	
t-calculated	14.50	
p-value	0.00000000000008	
t-critical	2.05	

Looking at the post-test results of both Group A and Group B, it is visible in Table 3 that there is a significant difference between the scores in post-tests of A and B with a p-value of 0.000002075 at 95% confidence level (0.05). From the table, it is arguably visible that the performance of Group B improved a lot compared to Group A. Thus, it means that

the science dictionary helped in improving the students' test scores.

Table 3. Comparison of post-test scores of participants with and without science dictionary.

	Post-test	
	Group A	Group B
Mean	11.27	14.80
Variance	7.72	5.75
Observations	30	30
df	58	
t-calculated	5.273	
p-value	0.000002075	
t-critical	2.002	

And lastly, to truly compare the performance of Group A from Group B in terms of their achieved scores, the researchers analyze the difference between the gained scores of both groups from pre- to post-test. Table 4 shows that scores of Group B in post-test differs significantly from the scores of Group A in the same administered test with a returned p-value of 0.000000062 at 95% confidence level (0.05). Comparing the mean scores of the two groups, the table also revealed that Group B has higher average result for gained score during the pre- and post-test with a mean score of 8.87 than Group A with a mean score of 3.73.

Table 4. Comparison of gained scores of group A and group B.

	Gained scores	
	A	B
Mean	3.73	8.87
Variance	9.31	11.22
Observations	30	30
df	58	
t-calculated	6.206	
p-value	0.000000062	
t-critical	2.002	

DISCUSSION

It is evident in various literatures that specialized learning materials can greatly boost students' understanding and performance inside the classroom.

The role of teachers in the classroom is not only to facilitate how learning takes place but to also guarantee that proper concepts are being comprehended by the learners.

It is by fact that crafting specialized learning materials consume time and resources of the teachers however, for us to ensure proper learning takes place inside our classroom sacrifice is inevitable in the part of teachers.

With the results returned by this study, the researchers strongly suggest that utilization of specialized learning materials such as the science dictionary aimed towards the MELCs prescribed by the Department is therefore essential. Through the use of the said learning resources, teachers can make sure that competencies are being addressed and concepts are being grasped by the students during classroom discussion.

It is now that teachers need to put a lot of effort in guiding their students in order to bridge the learning gaps left behind by the COVID-19 pandemic.

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and fruitful one. Results of this research will not be possible without their guidance and expertise.

And more importantly, to the learner-participants of this research. This study was made possible through their cooperation with the proponents.

The results gathered by the researchers for this study will be for the benefit of the whole Apexian learners.

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