Enhancing Academic Performance Level of Grade 7 Students of Tiong Hen So Memorial High School Using Guided Discovery and Self-Learning Strategies

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Abstract — The study used guided discovery and self-learning strategies as intervention to enhance. The performance level of students in Biology at Tiong Hen So Memorial High School S.Y. 2020 2021. It investigated whether the guided discovery and self-learning approaches can provide opportunity to inculcate science concepts during lessons. A Form 2 class made up of 23 females and 25 male students were the respondents of the study. The data were collected using learning packages and pretest and posttest results. The data gathered were analyzed quantitatively. Prior to the intervention, students were performing below average in terms of Science Achievements. In the pretest, the data revealed that students obtained low rating along the four topics. The rating was described as low mastery. In the posttest, results showed a significant improvement evidenced by percentage scores along four topics: Parts and Functions of a Compound Microscope (32.38% to 47.08%), Preparing a Wet Mount, Focusing Specimen and Magnification (27.97% to 30.91%), Levels of Biological Organization: Cell to Biosphere (33.36% to 28.95%) and Plant and Animal Cells (29.44% to 35.81%). Through t-test, it was found that the students' performance level was different from p-value=0.00676 less that α=0.05. This may be attributed to the use of Guided Discovery and Self-Learning Strategies which could have helped them in understanding the lessons. The findings of the study showed that the academic performance level of the students improved after being exposed to guided discovery and self-learning strategies. This can serve as a baseline for further study in higher grade level and a longer time of exposure. Hence, it is recommended that the strategies be utilized in consideration of other factors such as the learners' academic abilities, skills, and backgrounds.

Keywords — Academic Performance Level, Guided-Discovery and Self-learning Strategies, Interventions

I.   Introduction

The existence of COVID-19 pandemic has highly affected the educational sector, and no one knows when it will end. It has brought extraordinary challenges on how to provide and deliver quality education amidst exceptional times, like during lockdowns or quarantines. Every country is presently implementing plans and procedures on how to contain the virus, and the infections are still continually rising (Tria, 2020). To curb the spread of COVID-19, most governments have opted to employ quarantine protocols and temporarily shut down their educational systems.

Consequently, more than a billion learners have been infected worldwide. Among this number are over 28 million Filipino learners across academic levels who must stay at home and comply with the Philippine government's quarantine measures (UNESCO, 2020).

In the Philippines basic education, the Department of Education (DepEd) implemented the Learning Continuity Plan (LCP) as DepEd Secretary Leonor Briones quipped," Education must continue even in times of crisis whether it may be a calamity, disaster, emergency, quarantine, or even war." (Department of Education, 2020). In response to this, the Department of Education (DepEd) provided Self-Learning Modules (SLMs) with the alternative learning modalities to be offered to various types of learners across the Philippines. The integration of SLMs with the alternative learning delivery modalities (modular, television-based, radio-based instruction, blended, and online)helped DepEd ensure that all learners have access to quality basic education for SY 2020-2021 with face-to-face classes still prohibited due to the public health situation.

Another arising challenge before the present COVID-19 pandemic, data revealed that in the 2018 Programme for International Assessment (PISA) implemented by Organisation for Economic Operation and Development (OECD), the Philippines scored 353 in Mathematics, 357 in Science, and 340 in Reading, which are all below the average of all countries which participated in the assessment. The said program comprehensively evaluates learner's knowledge in the three subjects, and how they apply such knowledge. Having participated in the triennial international assessment for the first time, the Philippines showed poor performance in science education. Specifically, Filipino students garnered an average score of 357 points, which is significantly lower than the average score of 489 points. Compared with all the ASEAN countries that participated in the assessment, the country "fared significantly lower in Scientific Literacy". Moreover, learners from private schools got an average of 399 points in Scientific Literacy, showing that it was significantly higher than that of students from public schools who got an average score of 347 points" (DepEd PISA 2018 National Report of the Philippines, 2019, p.36).

The National Capital Region (NCR) achieved the highest Scientific Literacy scores across the administrative regions. Meanwhile, Region 7 (Central Visayas) obtained the top average score in the Visayas, while Region 11 (Southern Mindanao) was the highest in Mindanao. In urban areas, the average performance of students was 370 points, which is significantly higher than the 333 points average performance of students in rural areas. In Region 5 (Bicol), the mean score is 346, with the standard error (SE) of 11.35 and confidence interval of 324 and 368, as compared to NCR who got 391 mean score, standard error of 8.49 and confidence interval of 374 and 408 (DepEd PISA 2018 National Report of the Philippines, 2019).

Students' poor performance was also observed in the National Achievement Test (NAT) of high school students given by the DepEd in 2006 (Philippine Basic Education, 2013 cited by Dioneda, 2019). The average NAT scores of public high school students in Science were 39.49% in SY 2004-2005, 37.98% in SY 2005-2006 and 40.53% in SY 2011-2012 in which, among other subjects, Science got the lowest average score. In Sorsogon Province, the Overall Mean Percentage

Score (MPS) in Science in the NAT was 42.12% in SY 2012-2013 and 48.86% in SY 2014-2015 (Fresnido, 2019). These low scores in Science reflect the performance of the students and the teachers, thereby calling for solutions to address the problems.

Generally, one very important area of study is the world of Natural Science, one component of which is Biology. According to Dalhatu & Babawuro (n.d), biology is one of the science subjects taught in secondary school level which has become one of the difficult subjects since it involves processes which are difficult to observe directly by the students. Therefore, many innovations have been made to enhance the teaching of science including Biology. One of its primary concerns is on the research-based direction for instructional refinements. Today, one instructional strategy which has recently utilized is the modular instruction to modular distance learning. Modular Distance Learning refers to a learning delivery that is in the form of individualized instruction where learners use self-learning modules in print or digital format, whichever is applicable in the context of the learner, with the guidance of any member of the family or other stakeholders in the community trained to serve as para-teachers or learning facilitators (DepEd Memo DM-CI-2020-00162, 2020)

However, based on observations and actual experience, students in Tiong Hen So Memorial High School find difficulty in studying their self-learning modules. They are not be able to connect with or relate to the materials or lessons. In addition, due to the unique background and different backgrounds and prior knowledge of students, the materials provided by DepEd may not be too high or too difficult for the students. To properly address these issues, the researcher will be supplementing a strategy- the use of guided discovery and self-learning strategies. The materials are anchored on specific students' learning needs, learning styles or abilities and backgrounds and are still complying with competencies expected of them.

Therefore, the researcher aims to develop a guided discovery and self-learning material to scaffold students' learning science, particularly the most essential learning competencies for Grade seven (7) students in Biology. Ease of understanding the material may bring about motivation to succeed.

Innovation, Intervention, and Strategy

Guided Discovery and Self-learning strategies are coined together as teaching strategy. The researcher integrated this kind of strategy to facilitate students in their modular distance learning. According to Krah (2015), guided discover (GD) method of teaching involves guiding students to seek information. Teachers serve as facilitators of learning in which students are encouraged to be responsible, autonomous and construct their own understanding of scientific concepts. Guided discovery approaches allow students to become independent thinkers and are ready to accept responsibilities. On the other hand, Akinmoyewa (2003) as cited in Krah (2015) defines self-learning as an instructional strategy which involves using instructional materials by students to learn without teacher's intervention or with minimum teacher guidance.

The study was in three major phases: pre-intervention, implementation of intervention, and post-intervention activities. In this study, the researcher developed Students' Instructional learning package. This is teaching and learning guide prepared by the Researcher for the students on guided discovery and self-learning. The package contained instructional objectives, primary source materials which are the study guides, manipulative materials and self-assessment worksheet. The learning package is tagged as Instructional Package for Guided Discovery and Self-Learning (IPGDSL) by Krah, 2015. Each student was given to learn on their own. The students follow the instructional guides which are the primary source materials, interact with the manipulative materials and carry out activities independently. The researcher asked facilitating questions which stimulate and help the learner to think and which are relevant to the assignment or task given. However, students who find the task difficult to do may negotiate with the teacher for change of task. At the end of lesson, the students answered self-assessment questions in the worksheet as evaluation. In addition, the students may be given homework. This learning package was used during the intervention package.

With all the information given, the researcher have developed instructional materials which validated by five master teachers to guide students from their self-learning since teachers may not be able to teach them due to modular distance learning and parents may have lack of knowledge about the lessons (in which anchored from Self-learning Modules (SLMs) and Most Essential Learning Competencies made by DepEd-Region V) to supervise and support their children.

Action research questions

The main purpose of this study is to determine the effect of using guided discovery and self-learning strategies to Grade 7 students in Biology. This aims to enhance the performance level of Grade 7 students in the 4th Quarter school year 2020-2021. Specifically, this sought to answer the following questions:

1. What is the level of performance of Grade 7 students before using guided discovery and self-learning strategies?

2. What is the level of performance of Grade 7 students after using guided discovery and self-learning strategies?

3. Is there a significant difference between the level of performance of Grade 7 students before and after the interventions?

II. Methodology

Action Research Methods

This action research utilized a within-group pretest-posttest experimental design. As cited by Rogayan, 2019, an action research covers a broad array of research strategies that dedicated to

the integrated production of knowledge and the implementation of change (Prudents & Aguja, 2015). Action research designs are systematic procedures done by teachers (or other individuals in an educational setting) to gather information about, and subsequently improve, the ways their particular educational setting operates, their teaching, and their student learning (Mills, 2011). In an experiment, the number of participants may be limited, and it may not be possible to involve more than one group. In these cases, the researcher studies a single group using a within-group experimental design (Creswell,2021).

a. Participants and/or other Sources of Data and Information

Participation in the study was voluntary. Informed consent was obtained from each participant included in the study. All Grade 7 Capricorn students took the pretest at the beginning of the study and the posttest at the end of the study; both tests were administered in the classroom. The study used the purposive sampling technique which involved deliberate selection of people considered to be the most appropriate source of data in line with the objectives of the study. 20 out of 48 students were selected as sample of the study based on their comparable previous grades and the researcher removed outliers in a homogeneous class. Their scores from both tests were recorded and included in the data analysis.

b. Data Gathering Methods

In order to answer the research problems, the following procedure was undertaken by the researcher:

Phase 1. Validation of Guided Discovery and Self-Learning Instructional Packages from 5 Master Teachers

Phase 2. Approval of the Schools Division Superintendent and school head to conduct the study and asking for consent of the parents.

Phase 3. Preparation of Biology Test Questionnaires, a 40-item tests adapted from DepEd Self-Learning Modules (SLMs) in Biology 7, which has internal consistency of reliability.

Phase 4. Administration of Pretest.

Phase 5. Application of the Strategy.

Phase 6. Administration of Posttest.

Data were analyzed using descriptive statistics like frequency counts, percent, mean, and standard deviation. The researcher came up with the following rating scale adapted from National Education Testing and Research Center (NETRC) scale for the performance level of mastery:

Mastery Level	Descriptive Equivalent
96%-100%	Mastered
86%-95%	Closely Approximating Mastery
66%-85%	Moving Towards Mastery
35%-65%	Average Mastery
16%-34%	Low Mastery
5%-15%	Very Low Mastery
0%-4%	Absolutely No Mastery

To test whether there is a difference in the performance level of mastery in the intervention group during the pretest and posttest, paired t-test for dependent samples was used.

Prior to the intervention period, learners were oriented on how the microscope distributed to them be manipulated. After 4 weeks of exposure to learning package, a posttest was conducted.

III. Results and Discussion

The data gathered during the four-week exposure period has been subjected to appropriate statistical measures and the results are shown in the succeeding discussions.

Table 1. Level of Performance of the Intervention Group in the Pretest along the Four Topics

Topics	Intervention Group	
	MPS	Description
Parts and Functions of a Compound Microscope	32.38%	Low Mastery
Preparing a Wet Mount, Focusing Specimen and Magnification	27.97%	Low Mastery
Levels of Biological Organization: Cell to Biosphere	33.36%	Low Mastery
Plant and Animal Cells	29.44%	Low Mastery
Overall Weighted Mean	30.79%	Low Mastery

Table 1 shows the level of performance of the intervention group along the four topics in Grade 7 Biology such as Parts and Functions of a Compound Microscope, Preparing a Wet Mount, Focusing Specimen and Magnification, Levels of Biological Organization: Cell to Biosphere and Plant and Animal Cells . The rating obtained by the students was expresses in percentage score or percent correct responses. As reflected in the table, intervention group got a low rating in pretest along the four topics. The rating was described as low mastery. It can be inferred from the result that prior to the intervention, respondents have the same level of prior knowledge in Biology 7. Getting high scores may not be possible in the pretest. Therefore, the said performance may be expected since lessons on this topic were not given to the students. According to Berry (2008), the pretests cover materials that a student is not expected to know but serve as a motivational tool and a "road map" for the students resulting to improved course performance. He further concluded that, it is important to point out that the pretest is designed to help students and taking them seriously will help their actual scores and make studying more efficient.

Moreover, the descriptive rating low mastery meant that the students need more improvement in terms of achieving the target performance level of 75% by DepEd.

Table 2. Level of Performance of the Intervention Group in the Posttest along the Four Topics

Topics	Intervention Group	
	MPS	Description
Parts and Functions of a Compound Microscope	47.08%	Average Mastery
Preparing a Wet Mount, Focusing Specimen and Magnification	30.91%	Low Mastery
Levels of Biological Organization: Cell to Biosphere	28.95%	Low Mastery
Plant and Animal Cells	35.81%	Average Mastery
Overall Weighted Mean	35.6875%	Average Mastery

Table 2 reflected the level of performance of the intervention group in the posttest along the four topics. As reflected, intervention group has the highest rating in Parts and Functions of a Compound Microscope, which was 47.08%, described as average mastery and lowest in Levels of Biological Organization: Cell to Biosphere, which was 28.95%, described as low mastery. Results revealed that there were improvements in the posttest performance of the students along four topics in Grade 7 Biology. As compared to the performance in the pretest of the intervention group (see Table 1), it can be observed that there was significant increase in their ratings in just two topics. It suggests that the GD and Self-learning strategies may not be too appropriate to all learning topics in Biology since the two topics require problem solving skills about magnification and visual representation for levels of organization which they find it difficult considering poor background knowledge. Nevertheless, the improvement of the ratings in two other topics may be attributed to

the use of guided discovery and self-learning strategies where students were actively involved in the learning process.

For the intervention group, the posttest was higher by 5% compared to the pretest scores (Table 1). 5% increase may be low but considering the respondents who belong to average or mostly below average and who had difficulty comprehending English language texts, little progress is still a progress. The result agrees with the study of Krah, 2015, it showed that the academic performance of the students improved after being exposed to guided discovery and self-learning strategies. The implications for teaching and learning are that guided discovery and self-learning strategies make Biology lessons more realistic as students are actively involved.

Table 3. Difference between the Performance of the Experimental Group in Pretest and Posttest

Statistical Basis	Statistical Analyses
Level of Significance	0.05
Degree of Freedom	19
P-value	0.00676
Decision on Ho	Reject
Conclusion	**Significant**

The t-test of dependent sample was employed to determine if there exists a significant difference after the application of the strategy. The result obtained a p-value of 0.00676 less that 0.05 level of significance. Statistical analysis shows that there is significant difference in the science achievement of Grade 7 Science students after the application of the Students' Guided Discovery and Self-learning Package. This finding is consistent with the study of Akanbi and Kolawole, 2014, they revealed that self-learning and guided discovery strategies improved students' achievement in biology. It was therefore recommended that teachers, curriculum developers and textbook writers adopt these two strategies for the improvement of students' learning outcomes in biology. In a similar vein, this result is in conformity with the findings of Rebecca, 2019, it revealed that guided discovery instructional strategy resulted in better performance of learners in science that direct instruction. Learners expressed an increased interest, motivation and self-efficacy after being exposed in guided discovery. Additionally, Amor and Maaloul (2016) examined the influence of guided discovery on student learning outcomes. Learners' performance was improved by guided discovery instructional strategy. However, there were shortcomings or difficulties in using the method. Its major strength is the ability to promote learners' motivation to learn.

IV. Conclusion

From the findings, the following conclusions are derived:

1. Prior to the intervention, the Grade 7 students are performing low mastery in Biology lessons.

2. After the intervention, the students' performance level of mastery improved form Low Mastery to Average Mastery.

3. Guided discovery and self-learning strategies is an effective strategy in enhancing academic performance level of students towards Biology.

V. Recommendations

From the findings, several recommendations were gathered:

1. Science teacher should use the "Guided discovery and self-learning strategies in enhancing students' achievement in Biology. This teaching strategy can be used not only in Science subject but also to other subject as discovery learning is concerned.

2. School head should encourage the science teachers to include GDL and self-learning strategies in their lessons.

3. The teacher should create a project proposal for development of the guided discovery and self-learning instructional package.

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