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THE USE OF FRAYER MODEL AS GRAPHIC ORGANIZER IN SCIENCE: ITS EFFECTS ON THE ACADEMIC PERFORMANCE OF COLLEGE STUDENTS

Ernie C. Avila[1,2]
[1]Faculty Researcher, Research Management Office-Polytechnic University of the Philippines
2 Faculty, Polytechnic University of the Philippines, Ragay, Camarines Sur Branch
ernieavila@ymail.com

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ABSTRACT

Frayer Model is a Graphic Organizer commonly used in teaching mathematics, social sciences, and language subjects but has never been tried in Science. The study aimed to determine the effects of the utilization of Frayer model as Graphic Organizer in the Academic Performance of First Year Bachelor of Science in Business Administration-Human Resource Management and Bachelor of Elementary Education students in Science, Technology and Society subject during the First Semester, 2018-2019. The study employed quasi-experimental research design. Data used in this study came from BSBA and BEED students (n=34 both experimental and control group) of Polytechnic University of the Philippines, Ragay, Camarines Sur Branch. A self-made test-paper was utilized; the statistical tools includes z-test for dependent and independent populations. The study revealed that the Frayer Model as Graphic Organizer highly significant improved the performance of the experimental group; and their performance highly differed with the control group . With such, it is recommended that science, technology and society teachers are advised to utilize the the Frayer Model as Graphic Organizer in science to improve the comprehension, and retention of college students on the said subject. Additional and complementary module utilizing the same organizer may be developed for other grade level sciences. Rubrics in assessing the student's performance in science must be used to ensure the effectiveness of the strategy.

I. INTRODUCTION

The ultimate goal of Department of Education is to produce quality individuals who can compete globally in terms of knowledge [1] through the K to 12 Curriculum that envisions the development of scientifically, technologically and environmentally literate and productive members of the society [2]. Abarro (2016) [3] cites that quality basic education is an essential tool for the preparation of students for the advance higher subjects. In view of that, Velado (2016) points out that the 21st century teaching calls for a kind of approaches and strategies that supports students' critically and creative thinking and the mastery of the subject matter [4].

Development and validation of quality instructional material's policy implications are that quality materials must be developed, allocated, and constructed. They must be made suitably to the competencies of the curriculum and should be made correctly for their intended learners [5]. An ideal teacher gives concern to the effective delivery of the lessons and put high values on the learning capabilities of his learners. Hence, according to Rio (2014) teacher must employs variety of methodologies, techniques and teaching strategies that can give to the students the hundred percent learning and acquisition of new skills [6].

Moreover, Alia et. al (2012) posits that the development of instructional materials must provide insights to promote teaching and learning of Science contents based on learning style and appropriate technology [7]. While Salvi-Opina (2014) says that the reinforcement of lesson discussed can be made through activities and games whether online or traditional that can be integrated to heighten students' interest in learning any subject [8].

In addition, Auditor and Naval (2014) highlighted that for the development and validation of instructional materials and modules, it must be acceptable and have a positive impact on students' performance, but it should be done carefully at different grade levels and in a variety of disciplines [9]. Thus, in August 2018, the researcher develop a Set of activities in Science, Technology and Society subject utilizing Frayer Model as Graphic Organizer. Its development aimed to address the low performance of the students in the said subject, and answer the issues of low vocabulary, low retention, low abstraction and low comprehension.

II. OBJECTIVES OF THE STUDY

The study aimed to (1) determine the significant improvement brought about by the use of graphic organizer; (2) test the significant difference in the pre/posttest mean gain of students in the experimental group (with Frayer Model Module instruction) and the control group (traditional instruction); and (3) propose pointers to improve the utilization of the activities in science subjects utilizing the Frayer Model as graphic organizer.

Hypotheses

There is no significant improvement on the student's academic performance after the use of the graphic organizer; and there is no significant difference on the pretest/post mean gain in the experimental and control group.

III. REVIEW OF RELATED LITERATURE

The key role of a teacher is to teach, which can be understood as to facilitate learning of some target curriculum. Therefore, teaching is tied to the notions of learning that if students do *not* learn, then whatever the teacher is doing does not deserve the label of 'teaching' (Zuljan and Vogrinc, 2010) [10]. Moreover, learning intentions like guided instruction methods, positively impact student learning. Thus, appropriateness of learning objectives, strategies and assessment criteria improve students' self-assessment abilities that further improve learning outcomes [11]. Also, Yoder (2014) cites that students need to learn how to monitor their progress toward meeting their goals since "when students self-reflect, they also need to learn when and how to seek help and where to search for resources." [12]

Developing effective learning modules and activities coincides with the study of Larawan (2013) that posits that "modules must be generally very satisfactory in terms of physical aspects, objectives, instructions, learning, and evaluative instrument using separate and combined evaluations." And should be "acceptable as a learning intervention that "paves the way to develop a self-learning kit suited to the idiosyncrasies of unique learners" [13]. Likewise, scaffolding through the use of module "may provide an opportunity for students to learn and have the skills to observe and understand social problems in the surrounding area, especially with regard to economic activity and natural resource utilization." [14] Wong and Philips (2010) highlighted that the literacy instructional modules can keep a constant focus on high standards of performance to make this assurance, and they could reshape the current state of summative assessments. Formulating a modules could help develop a literacy consensus around the meaning of scores and proficiency among the students [15]. Also, Nola (2005) says that by developing a module in teaching science can deal with the notion that when a student enters and leaves a classroom, it is understood that the students will be learning during their class and assume that learning will take place [16]. Lim (2010) says that this kind of study does not question if the learning is happening but explore what are the various outcomes, maybe beyond the learning outcomes expected, that a student can experience after utilizing the materials developed [17]. Developing competence among the 21st learners are further emphasized by the International Bureau of Education-UNESCO (2017) that "the rapid increase in the breadth and depth of human knowledge, and the subsequent challenge of selecting 'bits' of knowledge to constitute a curriculum" and the **"** main aim of curriculum should be to produce 'competent' young people, rather than students who can simply remember information and recall it for examination purposes. Curriculum developers (as well as teachers) are searching for ways to ensure that graduates from their schools have a base of knowledge, skills, attitudes, beliefs and values that will enable them to function successfully in the various roles they will have throughout their lives – as family and community members, as citizens, as students, as members of the workforce, and so on."

Furthermore, according to Vargas (2016) vocabulary is highly important in teaching science since "learning vocabulary is a fundamental step in learning to read. It is important to understand what students struggle with and how to best help them." [18]. Further, King (2011) says that the element of rich instruction should be a common thread in all vocabulary instruction in any subject, and a "variety of methods for direct vocabulary instruction that makes teaching an effective complement to indirect methods for word learning" [19]. Also, Aponte-Martinez (2012) says "Literacy is a key component of the content-area classroom - without good reading and writing skills, students cannot efficiently acquire information and accurately convey their learning"[20]. And Ilter (2016) found out that the graphic organizers research subject was more successful than the control group in terms of improving general word recognition knowledge and developed a meaningful leaps in acquisition of target word meanings. In addition, it was found that using different types of graphic organizers developed positive achievement emotions (i.e., enjoyment, hope and pride) more than contextual learning process [21].

As the research tried the effects of Frayer Model as Graphic Organizer, numerous studies pointed out the effectiveness of the utilization of graphic organizer in teaching. Florida Department of Education (2010) posit that by the use of appropriate graphic organizer as strategy, it promised to give students to develop and discover their own problem-solving strategies and become adept at using them for problem-solving. Thus, help them with their confidence in tackling problem-solving tasks in any situation, and enhance their reasoning skills. As soon as they develop and refine their own repertoire of problem-solving strategies, teachers can highlight or concentrate on a particular strategy, and discuss aspects and applications of the strategy in teaching various concepts [22].

Therefore, through the development of essential, acceptable and highly effective learning materials particularly the use of Frayer Model as Graphic Organizer in Science, Technology and Society can help teachers in the identification of appropriate learning strategies and measures that can improve learning through the use of innovative teaching strategies[25].

METHODS

Research Design

The study used quasi-experimental design utilizing pre-test post-test control group design to determine the significant effects of the Graphic Organizer on the Academic Performance of students in Science, Technology and Society.

Research Subjects

There were 17 boys and 17 girls for both experimental and control group. The study utilized the purposive sampling in the choice of Polytechnic University of the Philippines-Ragay, Camarines Sur Branch as the locale of the study and Science, Technology and Society as the subject of the study. BSBA-Human Resource

Management was the Experimental group while the BEED students served as the Control Group.

Research Procedure

Mainly, the researcher sought approval from the PUP-Ragay Branch Director and Academic Head for the conduct of the study. Prior and informed consent were accomplished by the researcher to ensure compliance to ethical standards. The researcher personally floated the test-papers to the research subjects. Likewise, the research subjects were pre-tested and post-tested.

Instrument

The study utilized a fifty item pre-test post-test was utilized to determine the significant improvement and effects of the utilization of the Frayer Model as Graphic Organizer in teaching Science, Technology and Society subject.

Data Analysis

The statistical tools used in the study include Weighted Mean, the z-test for dependent population was used to test significant difference of the pre-test/post-test results of the research subjects, and z-test for dependent population was used to determine the significant improvement from the pre-test to post-test results of the two research subjects.

RESULT AND DISCUSSION

Improvement from the Pre-test to Post-test of the Experimental group after the utilization of Frayer Model as Graphic Organizer in Science, Technology and Society

This objective was analyzed and discussed based on the results of pre-test to post-test results of the experimental group that utilized the Frayer Model as Graphic Organizer in Science, Technology and Society.

Table 1. Improvement from Pre-test to Post-test of the Experimental group after the utilization of Frayer Model as Graphic Organizer

Indicators	
Number of Cases	34
Population mean	36.79
Standard Deviation	7.09
Computed z	16.84
Tabular Value at 0.05	1.692
Decision on Ho	Rejected
Significance of Improvement	0.0005

This section validates the effectiveness of using the said graphic organizer on the students' academic performance which would serve as basis for conclusions and appropriate recommendations. Based from the data presented, the Experimental

Group performance highly improved after instruction and exposure to the Graphic Organizer. Based from the given results, it implies that Frayer Model can be used in in Science, Technology and Society especially among the college students for them to increase their knowledge and enhance their competencies in science subject that lead to better academic performance, and can transfer learning to actual lives.

Difference from the Pre-test to Post-test of the Research Subjects after the utilization of the Frayer Model as Graphic Organizer Science, Technology and Society

This objective was analyzed and discussed based on the results of pre-test to post-test results of the students who those utilized the Frayer Model as Graphic Organizer Science, Technology and Society and those who were not given the treatment. This section validates the effectiveness of using the said graphic organizer on the students' academic performance which would serve as basis for conclusions and appropriate recommendations.

Table 2. Difference from Pre-test to Post-test results of the Research Subjects

Indicators	Experimental Group	Control Group
Number of Cases	34	34
Population mean	36.53	29.94
Standard Deviation	5.61	6.32
Computed z	4.576	
Tabular Value at 0.05	1.668	
Decision on Ho	Rejected	
Significance of Difference	0.0005	

The students' performance of the two research subjects is different in the result of the post-test. The performance of the control group in the post test is low compared to the experimental group with a high performance.

It can be observed in the results from the table that the computed z-value is higher than the tabular value. Thus, the researcher rejected the null hypothesis and accept the alternative hypothesis. Hence, there is a significant difference was observed among the students who utilized Frayer Model as Graphic Organizer. The findings implies that there is really a need to use the graphic organizer in Science, Technology and Society students to improve their performance and promote retention and improvement in their vocabulary in science and improve their higher order thinking skills.

Pointers on the effective use of the Frayer Model as Graphic Organizer in teaching science subjects

This part intends to suggests pointers on how to effectively use the Frayer Model as Graphic Organizer in teaching Science, Technology and Society subject. Therefore, the researcher points the following pointers: Use the Frayer Model not just

only in the lecture and activity phase of the lesson but also in the deepening and motivation part; associate smaller concepts to the bigger ones by giving additional reading and summing up exercise, outline only the important topics that should use Frayer Model and create rubrics or assessment scale on how to rate each illustrations and answers of the students.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, these conclusions were formulated. The performance of the experimental group highly improved due to their utilization of the researcher-made module and activities utilizing Frayer Model as Graphic Organizer while there is a highly significance of difference between the post-test scores of the experimental group who utilized the researcher-made module in Science, technology and Society and the Control Group. And lastly, the pointers recommended by the researcher on how to effectively use the said graphic organizer in teaching Science were: Use the graphic organizer not just only in the lecture and activity phase of the lesson but also in the deepening and motivation part; associate smaller concepts to the bigger ones by giving additional reading and summing up exercise, outline only the important topics that should use Frayer Model and create rubrics or assessment scale on how to rate each illustrations and answers of the students.

Teacher must continuously venture out on the creation and validation of instructional materials and learning modules. However, it is recommended further that the materials must be ensured in terms of their validity by subjecting them on the content and external validity criteria. Services of the content and grammar editor must also be required to subject the medium utilized in the formulated module. Experts on the instructional materials and module must be invited as critics to further improve the modules and the guides must be extended to the students and teachers to determine its acceptability that can be used by diverse group of learners. The study does not include the effectiveness of the module as supplementary material in other topics and focus in in Science, Technology and Society subject and other science related subjects as well, hence future study maybe conducted to gauge the amount of contribution that the Frayer Model in the improvement of students' performance in other subject areas in the K to 12 Curriculum of the Philippines and in the higher education subjects.

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