IJAMS
INTERNATIONAL JOURNAL OF ADVANCED MULTIDISCIPLINARY STUDIES
Volume II, Issue 3 March 2022, eISSN: 2799-0664

Effectiveness of Home-Based Experimental Activities in Improving the Performance of Grade III Pupils in Science

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Abstract —The study evaluates the effectiveness of home-based experimental activities in improving the performance of Grade III pupils in Science. Utilizing the quasi-experimental research design for an in-depth analysis of the study, the researcher used the researcher-made test questions in Science based on the 2nd quarter MELCs. Simple Percentage, Weighted Mean and t-test of mean difference were the statistical tools used. Results of the study revealed a significant difference in the pre-test and post-test performances of the Grade III pupils in Science. Thus, home-based experimental activities are effective in improving the performance of the Grade III pupils in Science. Involving pupils in the teaching-learning process helps gain experiences by the pupils thereby improving their performance.

Keywords — Effectiveness, Home-Based, Experimental Activities, Performance, Grade III Pupils, Science

I. Introduction

Experiments play a tremendous role in Science education, (Kang & Wallace, 2005) but the impact of hands-on Science laboratories on students' knowledge still requires research and better understanding (Bretz, 2019). During the COVID-19 pandemic outbreak and public lockout, all educators on all levels all over the world were challenged to conduct classes online or in modular. Science teachers were in a particularly tough situation because they had to organize teaching of not only theoretical knowledge but also practical aspects, and therefore, they needed to transfer experiments and laboratory activities to an online environment or home-based activities. Technical progress and the development of modern information and communication technologies (ICTs) created a wealth of opportunities to introduce students to practical aspects of chemistry during distance learning lessons.

As an alternative, students can carry out experimental work at their homes using household substances or reagents sent to them (Arnaud, 2019). There have been studies comparing students'

performance in hands-on and virtual laboratory activities. Students' understanding was similar whether participation was in person or online, which implies that virtual laboratories are beneficial. They also save time and money and reduce chemical waste. However, all authors recommend a careful approach to changes and further research (Hawkins, et al., 2013; Enneking, et al., 2019; Pyatt, et al., 2012 & Winkelmann, et al., 2014). As Hensen and Barbera (2019) mentioned, not only is students' knowledge important in observing the impact of Science lessons, but students' anxiety and emotional satisfaction, the usefulness of the lab and equipment, the instructor, etc. may also influence students' affective outcomes more than the learning environment.

The situation that occurred because of the COVID-19 pandemic outbreak at the beginning of the year 2020 was surprising and challenging for all of us. UNESCO showed us another view of this crisis: almost 363.1 million children and youth have been affected by the closing of schools all around the world (UNESCO, 2020). Every teacher at every level of education had to deal with this situation. Most of the teachers were unprepared. Some of them switched to online classes, but many teachers did not know how to do it. In order to help educators during this uneasy time, many journals, associations, and platforms opened their resources (ACS, 2020). National organizations provided remote teaching support and webinars (ACS, 2020; AACT, 2020; Fergus, 2019; RSC, 2020 & UPPVIISR, 2020). Some of the teachers had formulated learning activity sheets and produce audio-video lessons to supplement the modules provided by DepEd. With these, pupils had a hard time in understanding the lessons if only the modules are to be provided to the pupils. According to Ekwueme, et al., (2015), children can learn mathematics and sciences effectively even before being exposed to formal school curriculum if basic Mathematics and Sciences concepts are communicated to them early using activity oriented (Hands-on) method of teaching. Mathematics and Science are practical and activity oriented and can best be learnt through inquiry (Okebukola in Mandor, 2002) and through intelligent manipulation of objects and symbols (Ekwueme, 2007).

Numerous diverse methods of teaching, learning and assessment are used in teaching science curriculum in every schools nowadays. According to Edgar Dale's Cone of Experience (Dale, 1969), people learn, retain and remember 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they see and hear, 70% of what they say and write, and 90% of what they say as they do a thing.

Based on Dale's Cone, the least effective methods of learning involve learning from information presented through written and verbal symbols, i.e., reading and hearing, while the most effective methods involve direct, purposeful learning experiences, such as hands-on or field experience (Anderson, n.d). The experiences in each stage can be mixed and are interrelated that fosters more meaningful learning. Direct purposeful experiences represent reality or the closest things to everyday life. Dale's Cone of Experience suggests that when choosing an instructional method, it is important to involve students in the process in order to maximize their information retention.

Moreover, the constructivist principle provides a frame of learning in which the learner constructs meaning based on previous experiences. It is according to Okebukola (2002), a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. Learning therefore is simply a process of adjusting our mental models to accommodate new experiences.

Incidentally, there are various practices which are carried out in the homes where children live and many of which have some scientific and technological implications that will fast track the teaching and learning of school science and technology. Ahiakwo (2006) called them home sciences which are students' construct which come from their homes and environmental experiences. Therefore, science should not be presented as an abstraction but be made concrete between what is experienced at home and what is learned in the schools.

Practice and practical activities in education provide considerable positive influence on the learning and motivation of students (Brownell et al., 2012; Easton & Gilburn, 2012; Hole, 2017; White et al., 2002). Practical learning experiences provide opportunities to engage multiple senses as you touch, smell and observe a study object or phenomenon, which creates a new way of knowing the theory by increased sensory and cognitive activity (Nabors et al., 2009; Willis, 2007). By including both vision, hearing, touch, and smell the students can link the knowledge to several parts of the brain, and this makes it easier to find that knowledge again later (Willis, 2007). Teaching in ways that include several senses, such as practical activities and experiments can therefore increase the learning outcomes for students (Nabors et al., 2009; Willis, 2007).

As observed during the first few weeks of implementing modular learning modality in Montebello Elementary School, especially the Grade III pupils, most of it wrongly answered and some of the pupils are not doing the experiments as stated in the modules. And this might be the reason of having the low performance in Science. Thus, the researcher is motivated to conduct this study in order to evaluate the effectiveness of home-based experimental activities in improving the performance of the Grade III pupils in Science. A proposed improvement plan will be formulated based on the findings of the study.

It is in the rationale that the researcher who is currently teaching in the above mentioned local, would like to delve worthy research undertaking that will benefit the school she is currently teaching and that of her Graduate Program.

This study evaluates the effectiveness of home-based experimental activities in improving the performance of the Grade III pupils in Science of Montebello Elementary School, Kananga II District, Leyte Division for School Year 2021-2022. The findings of the study were bases for the proposed improvement plan.

Specifically, this study sought to answer the following questions:

1. What is the performance of the Grade III pupils in Science before the home-based experimental activities?

2. What is the performance of Grade III pupils in Science after the home-based experimental activities?
3. Is there a significant difference in the pre-test and post-test performance of Grade III pupils in Science after the implementation of home-based experimental activities?
4. What improvement plan can be proposed based on the findings of this study?

II. Methodology

Design. This study employed the quasi-experimental research design employing the pre-test and post-test to evaluate the effectiveness of home-based experimental activities in improving the performance of Grade III pupils in Science. Montebello Elementary School, Kananga II District, Leyte Division is the main locale of the study. The 27 pupils enrolled in the said locale for School Year 2021-2022 are the main respondents of the study and a researcher-made test questions in Science of which the competencies are taken from the 2nd quarter Most Essential Learning Competencies (MELCs) is used. This research is focused in evaluating the effectiveness of home-based experimental activities in improving the performance of the Grade III pupils in Science and its relationship. A Proposed Improvement Plan based on the findings of the study is the output.

Sampling. There are 27 pupils are involved in this study. The research was conducted personally by the researcher with consent from the Local IATF and strictly following the prescribed Health Protocol during school meeting of teachers.

Research Procedure. The researcher prepared the research design and tools to be utilized in the study. Approval and recommendation from the Panel of Examiner of the Graduate Studies was sought. A letter request to conduct this study was forwarded to the Office of the Schools Division Superintendent. Upon approval, permission from the District Supervisor, District Science Coordinator and School Head was secured before the actual gathering of data. Validation of the instruments through the School Head, District Science Coordinator and District Supervisor was sought. Orientation of the participants and administration of the pre-test and post-test was done through face-to-face during home visitation. Permission from the Barangay and Local IATF was secured. After answering the pre-test, pupils were given home-based experimental activities enclosed in the modules for the subject. Learning facilitators were instructed to assist and guide the child while having the home-based experimental activities. After the 6-week conduct of home-based experiment, post-test was administered. Results of the tests were collected. Data were tallied and submitted for statistical treatment. Analysis and Interpretation of Data. Making of Proposed Intervention Plan followed.

Ethical Issues. The right to conduct the study was strictly adhered through the approval of the Schools Division Superintendent of the Division, District Supervisor, and school principal. Orientation of the respondents was done using face to face modality. In the orientation, issues and concerns were addressed and consent to be included in the study were signed.

Treatment of Data. The Simple Percentage and Weighted Mean was employed to determine the pre-test and post-test performances of the Grade III pupils in Science. t-Test of Mean Difference was used to determine the significant difference in the pre-test and post-test performances.

III. Results and Discussion

Table 1
Pre-Test Performance of Grade III Pupils in Science (N=27)

Score Range	Description	PRETEST	
		Frequency	%
17-20	Excellent	2	8
13-16	Very Good	16	59
9-12	Good	9	33
5-8	Fair	0	0
1-4	Poor	0	0
Total		27	100
Weighted Mean		**13.26**	**Very Good**

Table 1 presents the pre-test performance of Grade III pupils in Science. It was revealed on the table that among the 27 pupils, 2 or 8% got the score of 17-20 which is excellent, 16 or 59% got 13-16 which is very good and 9 or 33% got the score of 9-12. The weighted of 13.26 shows a very good pre-test performance of the Grade III pupils in Science. This means the before giving the home-based experimental activities, the Grade III pupils already attain the very good rating. This implies that the Grade III pupils need to have more intervention to improve their performance in Science. this implies further that practical work is essential to teaching and learning in the field of scientific studies and that good quality practical work helps develop pupil's understanding of scientific concepts and processes and home-based experimental activities is one of the practical works in Science.

Table 2
Post-Test Performance of Grade III Pupils in Science (N=27)

Score Range	Description	POST TEST	
		Frequency	%
17-20	Excellent	27	100
13-16	Very Good	0	0
9-12	Good	0	0
5-8	Fair	0	0
1-4	Poor	0	0
Total		27	100
Weighted Mean		**19.56**	**Excellent**

Table 2 presents the post-test performance of Grade III pupils in Science. It was revealed on the table that among the 27 Grade III pupils, all of them got a score of 17-20 which is excellent. The weighted mean of 19.56 shows excellent post-test performance in Science. this means that after the intervention given, all of them are able to achieve excellent rating. This implies that home-based experimental activities are effective in improving the performance of the Grade III pupils in Science. This implies further that positive learning outcomes is attained if pupils are involved in the teaching-learning process. Hands-on learning approach involves the child in a total learning experience which enhances the child's ability to think critically enable them to understand the concepts convey in the lesson thus, improving their performance.

Table 3
Test of Difference Between the Scores in the Pre-Test and Post-Test Performances of Grade III Pupils in Science

Aspects	Test Scores		Computed T	Critical T	Decision	Interpretation
Grade 3 Pupils in Science	Pre Post	13.26 19.56	1.211	0.422	Reject H_o	Significant

Table 3 presents the test of difference between the scores in the pre-test and post-test performances of Grade III pupils in Science. It was revealed on the table that the computed t of 1.211 is greater than the critical value or t of 0.422 and .05 level of significance, so null hypothesis is rejected. This means that there is a significant difference between the pre-test and post-test performances of Grade III pupils in Science. The pre-test of 13.26 has increased to 19.56 in the post-test after exposing the pupils to home-based experimental activities. This implies that home-based experimental activities as an example of hands-on approach in teaching, aid the pupils in

understanding the concepts convey in the lesson. Through manipulation of objects, abstract knowledge become more concrete and clearer so performance will improve.

IV. Conclusion

Results of the study revealed a significant difference in the pre-test and post-test performances of the Grade III pupils in Science. Thus, home-based experimental activities are effective in improving the performance of the Grade III pupils in Science. Involving pupils in the teaching-learning process helps gain experiences by the pupils thereby improving their performance.

V. Recommendations

1. The proposed improvement plan formulated should be utilized;
2. Science Teachers should expose the pupils to home-based experimental activities in Science;
3. Teachers should use appropriate and effective strategies and techniques that actively engage pupils in the learning process through the hands-on activities given in the modules;
4. Teachers should prepare a learner-centered activity which are based on concept and skills found in the MELC;
5. Teachers should be flexible and sensitive in dealing with pupil's needs;
6. Teachers should provide appropriate evaluation and assessment based on the lessons learned;
7. Teachers should provide home-based experimental activities for the pupils to accomplish on a given time;
8. School Heads should encourage teachers to conduct monitoring to the pupils while doing the home-based experimental activities;
9. School Heads should monitor the implementation of distance learning to teachers and pupils; and
10. Future researchers should replicate this study to include different locale and include different variables aside from the mentioned in this study.

ACKNOWLEDGMENT

This study is in partial fulfillment of the requirements for the Degree Master of Arts in Education major in School Administration and Supervision. Special thanks are extended: To Dr. Jasmine B. Misa, thesis adviser, for her competence, patience, insights, knowledge and consistent guidance in giving valuable comments and suggestions for the improvement of the manuscript; Dr. Bryant C. Acar, Dr. Annabelle A. Wenceslao, Dr. Elvin H. Wenceslao, panel of examiners;

her husband, Anecito and kids, Kizchia and Khenz, for their love, prayers, care and sacrifices and all support they provided; Mr. Allison M. Junio, District Head, Miss Gina A. Villena, School Head and teachers of Montebello Elementary School, pupils and parents and the whole community of Kananga II District; her parents, siblings, relatives, friends, and all people whom she asks for advices and prayers and To God, her deepest and sincerest gratitude.

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AUTHOR'S PROFILE

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The author is Mrs. Mary Joy S. Misagal. She was born on May 24, 1988 at Brgy. Montebello, Kananga, Leyte. She was married for almost 10 years with Mr. Anecito Misagal III and has two children. She's presently residing at Zone Mars Brgy. Montebello, Kananga, Leyte. She finished her elementary education at Montebello Elementary School, Brgy. Montebello, Kananga, Leyte in the year 1999-2000 and continue her quest for education and able to finish her secondary education at Kananga National High School, Kananga, Leyte in the year 2003-2004. She enrolled and finished her Bachelor in Elementary Education at Western Leyte College of Ormoc City, Inc. in the year 2007-2008. She took up Master of Arts in Education major in Supervision and Administration with complete academic requirements at Western Leyte College of Ormoc City, Inc.

She was teaching for almost twelve years and a Teacher III at Montebello Central School. Her first station was Sto. Niño Elementary School for 4 years handling Grade I for 3 years and Grade VI for 1 year and was transferred at Montebello Elementary School, now Montebello Central School under Kananga III District, Division of Leyte. Currently, she was teaching as Grade III Adviser. She also attended series of webinars/seminars and trainings to increase her professional growth as a teacher.