Assessing The Academic Performance Of Learners In Rural Public Elementary Schools On Science Education

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Abstract — The main objective of this study is to assess the academic performance of learners in rural public elementary schools on science education. The study employed a descriptive research design to the sample population comprised of fifty (50) of the fifty-eight (58) total population. This gathered data on the teachers' profile in terms of age, sex educational attainment, length of service, training attended in Science education, and performance rating, along with the school's

profile on their learners' academic performance, availability of basic science laboratory equipment, power supply, and internet connection. Through this, teachers' interventions in the unavailability of these and their suggestions on improving the academic performance of their learners were also obtained. Based on the result of the study, the rural elementary teachers' profiles are interconnected which when increased over time, the academic performance of the learners likewise increases and this affects the academic performance of the learners. The study further exhibited the insignificance of geographical location as a rural area, in the learning outcomes of schools, with the result of Very Satisfactory (grades 4-6 pupils) per DepEd proficiency level.

On the seemingly many challenges of Philippine K-12 Curriculum in assisting rural schools to deliver quality Science education, the researchers determined the Implementation of Science and Math Project (DepEd, 2011.), LightEd PH (DepEd, 2016), and DepEd Sim Card and Connectivity Program (DepEd, 2021) as initiatives to bridge the gap on the different difficulties mentioned in this research. In spite of all of these, the challenge remained for those rural elementary schools that are geographically isolated. However, this has not been a hindrance to the stationed teachers for the result showed that as mandated, they follow interventions/methods such as localization, scientific modelling, and experiential learning. Thus, though power and internet connectivity is important and makes teachers' work easier, Science Education is not entirely dependent on it for learning in the classroom to take place. The study further revealed that most of them suggested that the conduct of learning action cell sessions, contextualization of lesson plans/instruction, localization in the conduct of science-related experiments, and development of school-based projects, programs, and activities that will support in improving science can also contribute in improving the academic performance of the learners.

Keywords — Assessment, Science Education, Rural Elementary Schools, Performance

I. Introduction

"The lack of school infrastructure and resources to support the ideal teaching process is the most pressing issue pounding the Philippine basic education", a statement delivered on January 30 by Sarah V. Duterte, concurrently serving as Secretary to the Philippine Department of Education.

Education has a significant impact on the development of societies and individuals and science education occupies a key position among the disciplines taught in elementary schools as it promotes critical thinking, problem-solving abilities, and an appreciation of the natural world (Castro, et.al, 2015). According to Lee & Luykx (2007), science education in the primary grades is crucial for children's development of scientific concepts and ideas, however, the academic performance of pupils in public elementary schools in rural areas, where resources may be limited and instruction may not be of the best quality, has long been a concern (Cuesta, 2016). Many studies suggest that while more attention has been made to the particular circumstances of urban schools, less attention has been paid to the implications of such environments on teaching and learning (Biddle & Azano, 2016), and science education in rural areas has received much less attention (Avery, 2013).

Too many issues have been raised about providing quality education in rural areas. For instance, pupils have their own way of thinking about distinct traits of teachers, making teaching a difficult task (Kothari et al., 1996). Another is, while many teachers desired to undertake experiments and hands-on activities with their pupils, others had extremely limited access to the necessary tools and consumables, forcing teachers to adapt their teaching method due to a lack of science equipment and supplies (Zinger et al, 2020). Furthermore, Piere Santos (2014) expressed concern about the availability of internet connection and power supply, stating that the infrastructure of isolated rural schools is deprived and that they frequently lack basic services such as electricity and internet connection.

Indeed, instruction in rural classrooms is influenced by numerous factors within and outside of the classroom. These factors range from the larger policy level to school-specific factors, to available tools and resources within the classroom (Zinger et.al, 2020). With these issues, the current study intends to assess the present condition of the crucial gap in the presented scientific literature by evaluating the academic performance of learners in rural public elementary schools in science education. This study aims to contribute evidence-based recommendations to improve scientific education in underserved communities and/or schools by better understanding the factors that influence their learning outcomes.

Specifically, this study seeks to answer the following research questions:

1. What is the profile of teachers teaching science in terms of age, sex, educational attainment, length of service, training attended on Science education, and performance rating?
2. What is the profile of the rural public elementary schools according to their academic performance in Science, availability of basic science laboratory equipment, power supply, and internet connection?
3. What are the teachers' interventions in the unavailability of power supply and internet connection?
4. What suggestions can the teachers in Science in rural public schools offer to improve the performance of their learners?

II. Methodology

This section presents the research design respondents, ethical considerations, research instrument, data gathering procedure, and statistical treatment employed in the study.

Research Design

The researchers utilized a quantitative approach, a process that involves the collection and analysis of numerical data (Jansen, 2023). This further utilized a quantitative-descriptive design that seeks to describe and assess the current status of the academic performance of the learners in rural elementary schools.

Respondents

The respondents of this study were the Grade 4-6 teachers from the rural public elementary school in Uson South District. The Slovin's formula was used to get the total sample size of the population, presented in the following table.

Table 1
Grades 4-6 Rural Elementary Teachers Sample Population

District	Total Population	Sample Population
Uson South	58	50

Ethical Consideration

The researchers used Republic Act No. 10173, often known as the Data Privacy Act of 2012, to obtain consent from the respondents. The researchers also guaranteed that the responses were kept confidential and anonymous, and that there was no conflict of interest in the research procedure. In accordance with the study's aims and purpose, data were treated with the utmost confidentiality. Researchers maintained credibility by demonstrating expertise, honesty, and integrity in their research pursuits.

Research Instrument

In getting the responses of the teacher-respondents, the researchers used an approved survey questionnaire through Google form. The researchers crafted a Google form in the data-gathering phase which obtained the teacher-respondents profile along age, sex, educational attainment at the tertiary level, length of service, number of teaching-related training for the past years, and performance rating. Furthermore, the school profile was studied according to their academic performance in Science, availability of basic science laboratory equipment, power supply, and internet connection. Furthermore, data on the interventions conducted and their suggestions in improving the academic performance of the pupils were obtained.

Data Gathering Procedure

In coordination with the concerned district supervisor, the survey questionnaire through Google form was administered to the fifty (50) randomly selected teacher-respondents. Upon retrieval of the 100% answered survey questionnaires, the data were analyzed by getting the percentage of their responses.

Statistical Treatment of Data

The researchers used the following data treatment in analyzing the data:

Percentage. According to Calmorin (1997), a percentage is a way of expressing a proportion, a ratio, or a fraction in relation to a whole with 100 as a denominator.

Formula: Percentage = f/N x 100%"

Where: f - frequency

N - population

III. Results and Discussion

This section contains the presentation, analysis, and findings of the results from the undertaken study.

Table 2
Profile of Teachers in terms of Age, Sex, Educational Attainment in Tertiary Level, Length of Service, Number of Teaching-related Training for the Past Years, Level of Training Attended in Science for the Past Three Years, and Performance Rating for the School Year 2022-2023

Profile of Teachers	Frequency	Percent
Age		
20-30	17	34
30-40	30	60
40-50	3	6
Sex		
Male	16	32
Female	34	68
Educational Attainment		
Bachelor of Elementary Education	36	72
Bachelor in Secondary Education	14	28
Length of Service		
0-10	25	50
11-20	23	46
21-30	2	4
Number of Attended Science-related Training		
0-10	50	100
Training attended by the Science Teachers for the past three years		
District Roll-out Training in Science	24	48
National Learning Camp in Science	6	12
Yes-O Training	3	6
Science Fair	2	4

Division Seminar in Critical Content & Pedagogical Retooling	3	6
Science Conferences	2	4
None	10	20
Science Teacher's Performance Rating		
Outstanding(4.500-5.00)	40	80
Very Satisfactory (3.500-3.499)	10	10

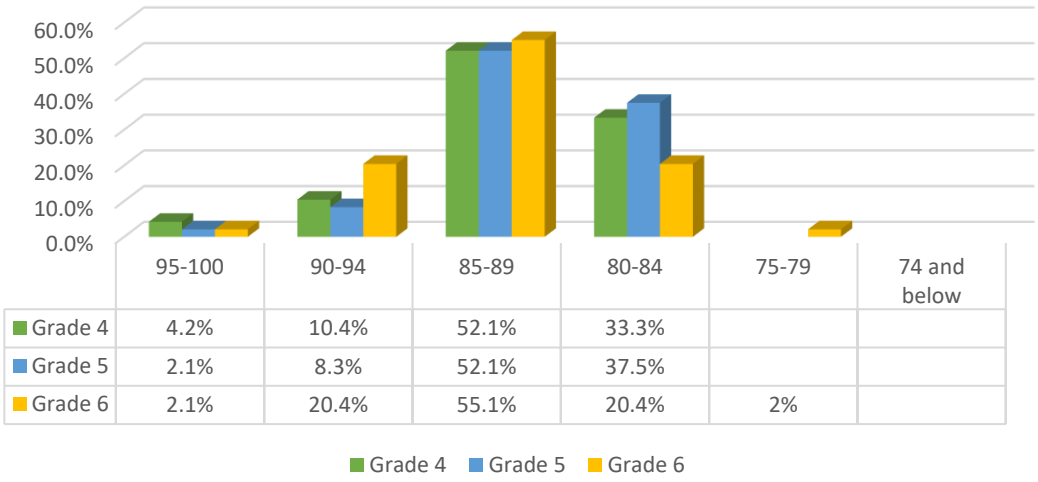
Table 1 shows the profile of teachers along age, sex, educational attainment at the tertiary level, length of service, number of teaching-related training for the past years, level of training attended in science for the past three years, and performance rating for the school year 2022-2023.

It presents the age of the respondents of the rural public elementary teachers which ranges from 20-50 years old. Among the 50 sample population, 6% or 3 out of 50 teachers are 40-50 years old, 34% or 17 are 20-30 years old, and 60% or 30 are 30-40 years old. On the other hand, data on their length of service implicitly shows that 50% of the teachers handling Science are 0-10 years in service, while 46% are 11-20 years already. It can be inferred that most of the teachers entered the Department of Education between 20-25 years old with 0-10 years in service, and the majority of them have undergone the first implementation of the Philippine K to12 Curriculum. However, modification has been continuous and teachers shall be able to adapt to the improvements it entails to deliver a high-impact teaching-learning experience. Researches in the past years show that many positive and negative views have been put forward regarding age and teaching experience. It is a general thought that as age advances and designation is promoted, teachers lose the enthusiasm to teach, while some thought that age and experience go hand in hand (Shilpa Rajesh Shah and Usha Subodh Udgaonkar, 2018). Moreover, the graph shows that the rural elementary teachers are comprised of 68% or 34 female respondents and 32% or 16 male respondents. Studies show that the role of teacher gender in student learning likely differs by context (Cho, 2012). However, because most scholars use data from students at a specific grade or school level; whether the roles of teacher gender in student achievement vary across students' developmental stages remains largely unexplored (cf. Winters et al., 2013).

On the other hand, the table reveals the educational attainment at the tertiary level of elementary Science teachers with 64% or 32 teachers who earned a Bachelor in Elementary Education, major in General Education, 30% or 15 teachers earned a Bachelor of Secondary Education, and the 2% earned a Bachelor of Elementary Education major in Pre-school Education. Thus, the majority of the teachers have been prepared and are competent in teaching the subject in support to the conclusion that if all teachers have a degree, with the right specialization, the student's achievement would likely improve (Ogbonnaya, 2009). This also supports the findings of Akin (2013), Van den Bergh and Roos (2014), and Boyd et al 2008, who found out that teachers' qualifications contributed to the improvement of students' academic performance.

Furthermore, the table shows that 100% of the teachers attended 0-10 training in Science in the past years. Most of them attended District Roll-out Training (48%), National Learning Camp (12%), Yes-O Training and Division Seminar in Critical Content & Pedagogical Retooling (6%), and Science Fair and Science Conferences (4%), whereas 20% of them responded to none. Philippine MATATAG Curriculum is under modification and transitions for its full implementation are prevalent, hence, teachers' professional development which focuses on retooling and upskilling teaching pedagogies that certainly improve student's learning outcomes is necessary. Indeed, an alteration to the fact that no one can give what he/she does not possess, quality teachers constantly strive to possess all the requisite training and knowledge required to discharge their duties effectively and efficiently (Yusuf, et.al, 2016). Nevertheless, it is good to note that a high percentage of the teachers in rural areas are given the opportunities to attend professional development training, although there's still a low percentage who did not attend any training since small rural school districts tend to have limited capacity for professional development.

Figure 1
Profile of Rural Public Elementary Schools according to their Academic Performance in Science, Availability of Basic Science Laboratory Equipment, Power Supply, and Internet Connection
1.1 Academic Performance in Science of Grades 4-6 Pupils



	95-100	90-94	85-89	80-84	75-79	74 and below
Grade 4	4.2%	10.4%	52.1%	33.3%		
Grade 5	2.1%	8.3%	52.1%	37.5%		
Grade 6	2.1%	20.4%	55.1%	20.4%	2%	

Figure 1.1 exhibits the academic performance in Science of Grades 4-6 pupils. From the table, it can be deduced that 2.1 to 4.2 percent of the pupils' average is 95-100, 8.3 to 20.4 percent got 90-94, 52.1 percent got 85-89, 20.4 percent to 37.5 percent got 80-84, and 2 percent of the pupils got an average from 75-79. This implies that with 52.1 percent in 85-89 as the highest, the

pupils in rural elementary school's level is Very Satisfactory per the Philippine Department of Education level of proficiency. This proves Considine and Zappala (2002) study whose findings show that geographical location does not significantly predict learning outcomes in school. This further proves the several recorded well-founded reports of the University of Aston that secondary schools have found pupils from small rural schools, not only as well prepared academically as they are, but they also generally had a better attitude to work.

1.2 Availability of the Basic Science Laboratory Equipment

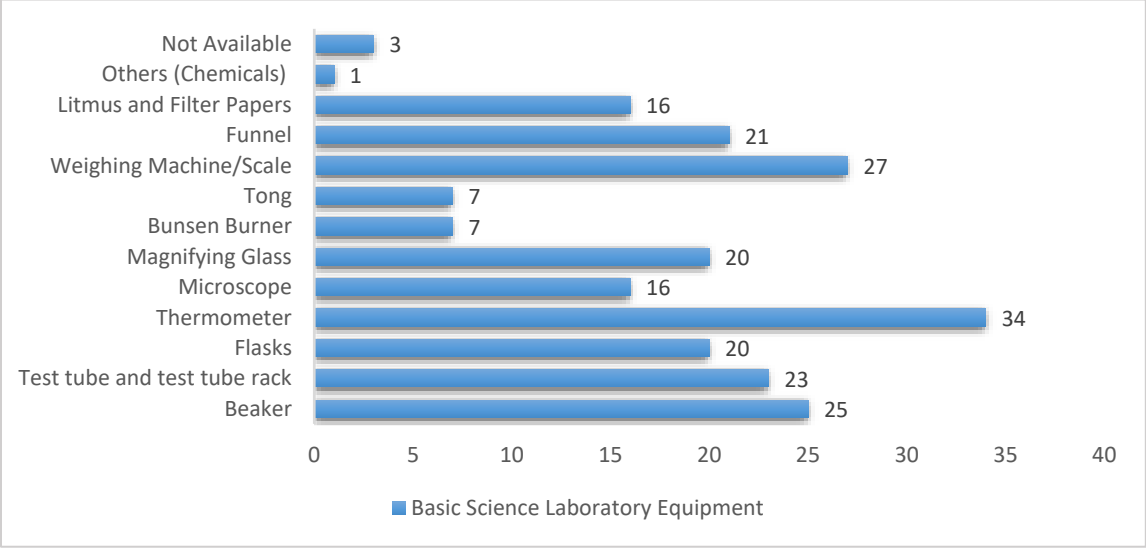


Figure 1.2 indicates the basic science laboratory equipment available in rural elementary schools. It shows that most schools have thermometers with 34 responses, weighing machines/scales with 27 responses, beakers with 25 responses, test tube and test tube rack with 23 responses, funnel with 21 responses, magnifying glass and flasks with 20 responses, litmus and filter papers with 16 responses, tong, and bunsen burner with 7 responses and 1 with chemicals. On the other hand, three (3) schools responded to none. This connotes that most schools are Science Laboratory recipients and/or schools allot funds for this needed equipment in the teaching and learning process. Science, perhaps more than any other subjects, calls for a wide range of materials and activities for students to experience meaningful learning, however lack of materials has been a central concern in schools in underserved communities (Darling-Hammond, 2010; Johnson, 2006). This issue has been circulating and studies revealed this to be a big gap in making learning relevant to learners. To bridge this gap, the Department of Education through the National Science Teaching Instrumentation Center (NSTIC) released the order on the Implementation of Science and Math Equipment Project (DepEd, 2011) which contains laboratory glassware and storage cabinet that gave opportunities to small schools in rural areas to have enough materials for an effective teaching-learning process on Science Education. In addition to this, in the past three years, additional materials have been also issued to schools such as human torso models, maps, globes, and plastic science charts. Thus, the disparity in access to science equipment and learning

materials is gradually decreasing, resulting in the increased academic performance of pupils in rural elementary schools.

1.3 Availability of Power Supply

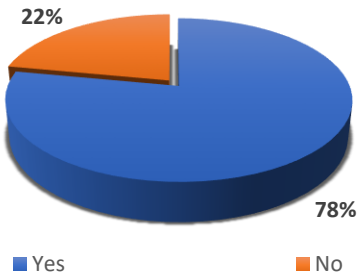


Figure 1.3 shows that 78% of rural elementary schools have a power supply and 22% have no available power supply. This implies that electrification is already evident in most rural accessible elementary schools. However, a small percentage which can be those geographically isolated and disadvantaged areas is still deprived of power supply, which can unequivocally compromise the learners' academic performance. For this reason, the Department of Education through the Assistance of the National Electrification Administration (NEA) embarked on a campaign called “LightEd PH” with the goal of delivering electricity to schools through existing local electrical connections within the surrounding community or coverage area (DepEd, 2016). Indeed, access to energy services is expected to have a multi-dimensional impact on education (Dinkelman, 2012), and the gradual success of the rural development projects along with education radiate in the academic performance of the learners.

1.4 Availability of Internet Connection

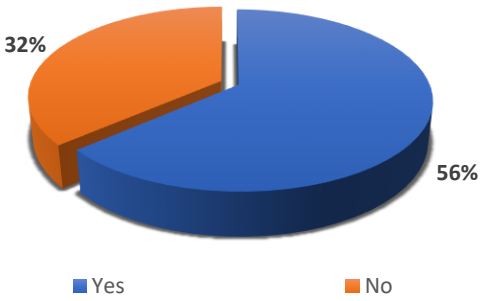
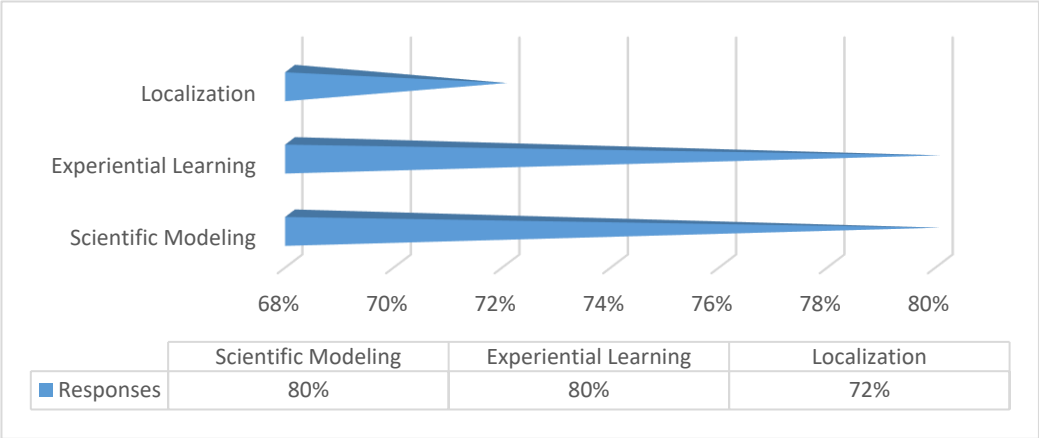


Figure 1.4 presents the availability of internet connection in rural elementary schools, where 56% have an internet connection and 32% have no access to the internet. It can be deduced

that internet connectivity is still a challenge that many schools are facing. This proves the study on internet connectivity in rural areas that remote and sparsely populated areas typically lack the telecommunications infrastructure for reliable and fast Internet connections (Strover, 2011). This also proves the series of digital inclusion initiatives of the Department of Education in addressing it from 2009 until today. Nevertheless, the DepEd Sim Card and Connectivity Program (DepEd, 2021) were launched to give teachers free access to e-learning apps that will aid them in preparing their lessons.

Figure 2
Rural Elementary Teachers' Interventions in Unavailability of Power Supply and Internet Connection



In spite of the data shown on access to the power supply of rural elementary schools, it is beyond doubt that brownout is frequent and affects the delivery of instruction inside the classroom. Figure 2 reveals the rural elementary teacher's intervention in the unavailability of power supply and internet connection where 80% of the teachers in rural areas responded to the experiential and scientific learning approach. While 20% of them also explore ideas and make models by reading and following directions and/or watching offline videos. The theory lying at the basis of this type of activity based on experience is a constructivist one and can be expressed briefly by the principle of learning by doing (Cocorada, 2010). In this method, students are considered active partners in the learning process, wherein previous experience (schema) is used in building present learning. On the other hand, scientific modeling is a scientific activity that aims to make a particular part or feature of the world easier to understand, define, quantify, visualize, or simulate by referencing it to existing and usually accepted knowledge (Wikipedia). It is worth noting that although power and internet connectivity is important and makes teachers' work easier, Science Education is not entirely dependent on it for learning in the classroom to take place.

Figure 3
Suggestions in Improving the Academic Performance of the Learners in Science

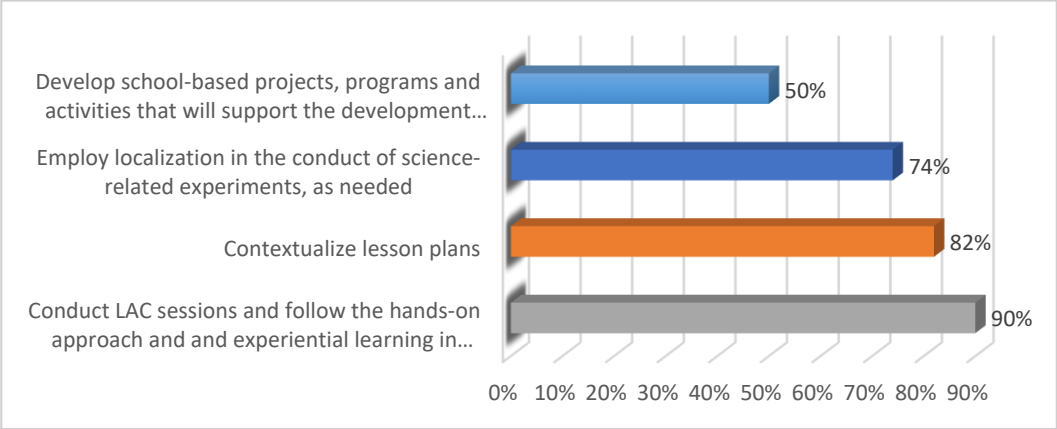


Figure 3 reveals the suggestions of the rural elementary teachers in improving the academic performance of the learners. From this, it can be inferred that 90% of them consider the conduct of LAC sessions as supported by Hellsten et. Al (2011) that Professional development is a way to break down teacher isolation and to build networks with other teachers. While 82% suggest contextualization of lesson plans/instruction and 74% employ localization in the conduct of science-related experiments where teachers' reports greatly show that there is more access to elementary outdoor science-related activities in rural areas (Zinger et.al, 2020). On the other hand, 50% consider the development of school-based projects, programs, and activities that will support in improving science education supported by the intensified monitoring and evaluation of project, programs and activities to improve access and basic quality education (DepEd, 2022).

IV. Conclusion

Based on the result and discussion of the study, the rural elementary teachers' profile along age, length of service, number, and level of teaching-related training, and performance affects the improvement of the academic performance of the pupils. These variables are interconnected which when increased over time, the academic performance of the learners likewise increases. This study further supports research that reveals the insignificance of geographical location in the learning outcomes of schools, with the result of Very Satisfactory (grades 4-6 pupils) per DepEd proficiency level.

The Philippine K-12 curriculum is facing so many challenges, especially in assisting rural schools to deliver quality basic education. These challenges include the schools' procurement of basic science laboratory equipment, availability of power supply, and internet connection. Through this study, the researchers determined the Implementation of Science and Math Project (DepEd, 2011), LightEd PH (DepEd, 2016) and DepEd Sim Card and Connectivity Program (DepEd, 2021) as initiatives to bridge the gap in the different difficulties mentioned. In spite of all of these, the challenge remains for those rural elementary schools that are geographically isolated. However,

this has not been a hindrance to the stationed teachers for the result shows that as mandated, they follow interventions/methods such as localization, scientific modeling, and experiential learning. Thus, power and internet connectivity is important and makes teachers' work easier, Science Education is not entirely dependent on it for learning in the classroom to take place. Furthermore.

V. Recommendations

In view of the presented results and discussion, the following recommendations are given:

1. Policymakers should promote inclusive education by focusing on the provision of power and internet connection to geographically isolated and disadvantaged school areas.

2. Administrators may include a representative from each school in at least every division reskilling/upskilling training/seminar for teachers. Through this, equal opportunities will be given and first-hand information on Science Education will be delivered to the teachers.

3. District supervisors and learning area coordinators can enhance the monitoring scheme in determining the challenges faced by elementary schools on Science, especially those geographically isolated schools. They can also monitor the inclusion of the basic science laboratory equipment/materials in the school's improvement plan and/or procurement plan.

4. School Heads shall strictly monitor the teaching-learning process in Science and include the provision of the needed equipment/materials in the School Improvement Plan and/or Annual Improvement Plan, as deemed necessary.

5. Teachers, as mandated by the Education Department, shall conduct research (action/basic) in continuously delivering research-based practices and innovations in improving the academic performance of elementary pupils.

6. Future researchers may also magnify the different interventions provided by the teachers in teaching Science and identify their best practices in improving the academic performance of their pupils through the conduct of qualitative research.

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