

Effectiveness of Developed Learning Activity Sheets (LASS) In Improving the Performance of Students in Grade 9 Chemistry

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ABSTRACT: This study determined the effectiveness of developed Learning Activity Sheets (LASs) in improving the performance of Grade 9 students in Chemistry. It used a quasi-experimental design to collect data from the population and determine how the control and experimental groups performed on the pretest and posttest along the seven identified Chemistry topics. The primary data was collected from 60 students in grade 9 at Panlayaan National High School using a teacher-made test. Frequency, weighted mean, average, and t-test for independent samples were used to evaluate and interpret the findings. The analysis showed that before attending lessons and using the LASs, the two groups had comparable prior knowledge and skills in the subject. The results of the two groups of respondents' pretests did not significantly differ from one another. In the posttest, both groups performed better but the experimental group outperformed the control group. The two groups of respondents perform differently. The use of LASs may be responsible for the experimental group's considerable improvement in performance. It is recommended that teachers may develop innovative teaching materials to improve the performance of the learners and further examine the parts and content of LASs to improve their efficacy.

Keywords - Effectiveness, Learning Activity Sheets (LASs), Performance

I. INTRODUCTION

Most countries around the globe experience a huge blow in the educational systems because of the Covid-19 pandemic. It has prompted school closures in more than a dozen countries, interfering with the education of at least 290.5 million students worldwide (UNESCO, 2020). According to UNESCO Director-General Audrey Azoulay in a statement released (McCarthy, 2020), the current educational disruption is unprecedented in its global scope and pace and, if it persists, could endanger the right to education. He added that they are collaborating with nations to assure the continuity of learning for all. Responses to the crisis vary among nations. Others are sending paper-based tasks to students' homes or using public TV and radio broadcasting channels, while some have developed programs for remote learning and homeschooling that offer free online resources.

Due to this pandemic, the way education is delivered in the Philippines has changed starting on the last quarter of the academic year 2019–2020 and carrying on to the present. On that year, President Duterte decided that there won't be any in-person classes during the 2020–2021 school year. In connection with this, the secretary of the Department of Education (DepEd, 2020), Leonor Briones announced that education must continue in compliance with the health standards set forth by the Department of Health (DOH) and the World Health Organization (WHO). Many obstacles arose because of these choices, including limited technology and internet connection, the need to use new learning methods, changes to the new normal, and the effect on the mental health of DepEd employees, learners, stakeholders, and many more.

Aside from this, the country is also facing a great challenge on poor performance in science in international and national assessments. In the Organization for Economic Cooperation and Development's (OECD) 2018 Programme for International Student Assessment (PISA) global survey, the Philippines is placed second-to-last among the 79 participating countries in science. Likewise, the Philippines scored 249 in science on the 2019 Trends in International Mathematics and Science Study (TIMSS) by the International Association for Evaluation of Educational Achievement (IEA), which is lower than how the nation performed in 2003

(TIMMS, 2019). In the National Achievement Test (NAT) of Grade 10 learners, science scored the lowest in performance coming in second to Mathematics with an overall mean of 36.91, which is below the national standard level of acceptable Mean Percentage Score (MPS), which is 75% (NAT, 2018). Science is indeed undoubtedly one of the most challenging academic subjects. It is for this reason that the DepEd has made science education a primary priority.

The department issued DepEd Order No. 12 series of 2020, which established new learning delivery modalities in all levels that were embodied in the Learning Continuity Plan (LCP) for the school year 2020–2021, in order to ensure the continuity of learning while ensuring the health, safety, and well-being of everyone involved in the educational process. All students were to get teaching through alternative formats, regardless of who they were or where they were located. Some of the Learning Delivery Modalities (LDMs) that were used were blended learning, homeschooling, and distance learning.

Using the Learning Enrollment and Survey Form (LESF), the DepEd conducted a survey on the start of the school year (DepEd, 2020). Findings from the survey show that the majority of typical Filipino students found self-paced, or modular learning to be a very practical kind of distance education. Most parents or guardians selected it as their children's preferred method of teaching. The SLM is based on the Most Essential Learning Competencies (MELCS). The department believe that the MELCS will make it possible to concentrate instruction on the most crucial and necessary competencies that students must learn.

It was stated in the Memorandum OUCI-2020-307 entitled Suggested Measures to Foster 'Academic Ease' During the Covid-19 Pandemic that the rules outlined in DO No.12, s. 2020 on the Basic Education Learning Continuity Plan (BE-LCP) acknowledge the importance of contextualization-based flexibility in the teaching-learning process. As stated, stress and workload associated with using one of DepEd's many distant learning modalities will be lessened by recommending that schools can decide which of the self-paced learning modules (SLMs) or learning activity sheets (LAS) for the first quarter will be optional, allowing students to concentrate on the most important activities while giving fast learners the opportunity to complete additional tasks. Additional learning resources created by supervisors, specialists, and teachers may be employed to complement the SLMs, but only if these materials are in line with the MELCS, as stated in the Memorandum DM-CI-2020-00162.

In Sorsogon City Division, all schools adopted Modular Distance Learning (MDL) using printed instructional materials based on the result of the survey. SLMs were used in the first quarter of the opening of classes of SY: 2020-2021. In Science and Technology 9, the teachers were provided 18 SLMs, each with roughly 20 pages, and nearly all the teachers expressed dissatisfaction that students were unable to complete all the activities in the SLMs. Pupils, parents, and teachers at the school appear to find the DepEd-provided modules to be a major issue because it resulted to inadequate data on teachers' record sheets, a lack of sources for data for the computation of grades, and students' intention to drop from the class (Bordeos, 2021). Without the teacher's guidance, students struggle to respond to the modules (Anzaldo, 2021). This is one of the reasons why the City Division also developed learning activity sheets (LASs) composed of more or less 4 pages as per RM No. 86, s. 2020.

As stated in the DepEd Learning Resource Management System (DepEd-LRMS, 2015), LAS may be planned and developed by teachers under the direction of the division learning area supervisors and school heads. This would be useful to teachers as they are able to select the activities that are most appropriate for students. Most division offices, including the Sorsogon City Division, developed LASs in all study areas including Science & Technology 9 on the second quarter of SY 2020-2021. Subject area supervisors validated these developed LASs through the help of selected teachers comprising the Division Learning Resource Management and Development System (LRMDS) Quality Assurance Team by following the guidelines and processes for LRMDS Assessment and Evaluation. In the second quarter of SY 2020-2021, teachers in all schools were provided the MELCS and developed weekly LASs by the city division. SLMs and textbooks were also given as supplemental references to the learners.

Relative to the poor performance of the country in science, the computed Performance Level (PL) in science of Grade 9 students of Panlayaan National High School, SY 2019-2020 is poor which is also true to other previous school years' computed PL. It suggests that science must be prioritized as a challenging subject such as in terms of the strategies and instructional materials used during the teaching-learning process. Even though most classes across the country have returned to a normal face-to-face teaching-learning process in school year 2022-2023, teachers are still using the developed LASs for a variety of situations and reasons. It is for this reason that the researcher came up with an idea that there is a need to evaluate the effectiveness of the developed learning activity sheets. Even though the pandemic is there or not, there is still a need to empower learners to guarantee that they receive high-quality education.

To provide a solution to the issues on emergencies like this pandemic and to students' poor performance in science subjects, the researcher found it vital to ascertain that the developed LASs is useful in

improving the performance of Grade 9 students in Chemistry at Panlayaan National High School, School Year 2022-2023.

II. AIM AND OBJECTIVES OF THE STUDY

This study aimed to determine the effectiveness of the developed Learning Activity Sheets (LASs) in improving the performance of Grade 9 students in Science at Panlayaan National High School, School Year 2022-2023. Specifically, it sought answers to the following questions:

1. What is the performance of the control and experimental group in the pretest along:
 - a. Quantum Mechanical Model;
 - b. Ionic Bonding;
 - c. Properties of Ionic and Covalent Compounds;
 - d. Carbon & Its Properties;
 - e. Organic Compounds;
 - f. Mole Concept; and
 - g. Percentage Composition of Compounds?
2. Is there a significant difference between the performance of the control and experimental group in the pretest?
3. What is the performance of the control and experimental group in the posttest along the identified topics?
4. Is there a significant difference between the performance of the control and experimental group in the posttest?

III. RESEARCH DESIGN AND METHODOLOGY

This study determined the effectiveness of utilizing learning activity sheets in improving the performance level in Chemistry of Grade 9 Students in Panlayaan National High School, Panlayaan Sorsogon City, school year 2022- 2023. Test questions and LASs were the primary tools used in the study's data collection component. A quasi-experimental pretest-posttest design was utilized to determine the academic performance of Grade 9 Science students. It includes a pre-test measure followed by attending a traditional face-to-face class, the administration of the LASs in experimental group and a post-test for both groups. To determine if the LASs had a statistically significant impact on scores, the t-test was used to analyze the variations in pre-test and post-test scores for the control and experimental groups.

3.1 The Sample

The key respondents to this study were the Grade 9 science students officially enrolled in Panlayaan National High School, School Year 2022-2023.

TABLE 1

The Respondents

Groups	Frequency(f)	Percentage (%)
Control Group	30	50
Experimental Group	30	50
Total	60	100

In getting the target respondents, the researcher used the fishbowl technique to choose two (2) sections from four Grade 9 classes. In order to arrive at the final sample size of 30 for each group, the researcher obtained the average of grades in Science & Technology 8 of the students in these two sections, ranked it from highest to lowest, and removed the outliers.

3.2 The Instrument

This study utilized seven (7) SDO developed and validated Learning Activity Sheets (LASs), Table of Specification (TOS) and Pretest/Posttest to determine the effectiveness of using the LASs. The Learning Activity Sheets (LASs) is 2 to 4 pages consumable learning material in Chemistry having four parts; Objectives, Presentation of the Lesson, Practice Exercises for learners to work on and Evaluation. A 35-item multiple choice pre- and post-test is used to assess the learning benefit/effect of utilizing the LASs. This teacher-made test (Pre/Posttest) was checked and validated by experts. The test's equal distribution of items for each skill or learning competence was shown in the Table of Specifications (TOS). Quantum Mechanical Model, Ionic Bonding, Properties of Ionic and Covalent Compounds, Carbon & Its Properties, Organic Compounds, Mole Concept, and Percentage Composition of Compounds were among the topics covered in grade 9 Chemistry.

3.3 Data Gathering Procedure

In conducting this study, permission was sought from the superintendent of the Schools City Division of Sorsogon, the authors of the LASs, and the principal of Panlayaan National High School- the school where the research was carried out. The researcher personally conducted the pretest. Instructions on how to complete the test were given to the respondents. The 35-item multiple-choice exam was delivered to them with an hour to complete it. The researcher collected the test papers and response sheets immediately following the exam, examined the findings, documented them, and made them accessible for statistical analysis. After the conduct of the pretest, both groups attended the traditional face-to-face classes. The experimental group were provided the developed LASs right after the delivery of the said topic. They were instructed to work on it at home or during vacant time and submit it the next day before the start of the next lesson. After the delivery of the lessons through face-to-face classes and administration of the LASs for all the identified topics, posttest was administered. Right after the exam, the answers were checked and recorded. The collected data was tallied, evaluated, and interpreted using statistical tools to ascertain the students' performance level and the effectiveness of the learning activity sheets.

3.4 Data Analysis Procedures

The gathered data were treated statistically. The pre- and post-test test results for the respondents were examined, totaled, and evaluated. Performance levels on the pretest and posttest were calculated using the mean, frequency count, and percentage. The scale was adapted by the researcher from DepEd Order No.8, s. 2015 to assess the pupils' pre- and posttest performance and characterize them.

Performance Level	Description
96% - 100%	Outstanding
85% - 95%	Very Satisfactory
80% - 84%	Satisfactory
75% - 79%	Fairly Satisfactory
Below 75%	Did Not Meet the Expectations

The significant difference between the control and experimental groups' performance on the pretest and posttest was determined using a T-test for independent samples.

IV. RESULTS AND DISCUSSIONS

The pretest and posttest scores obtained were analyzed and utilized to answer the research questions and test the hypotheses appropriately. The results are presented using appropriate tables, which are ordered in a systematic manner.

TABLE 2

Performance of the Control Group and Experimental Group in the Pretest

Topics	Control Group				Experimental Group					
	Rating	Description			Rating	Description				
Quantum Mechanical Model	36.00%	Did	Not	Meet	the	35.33%	Did	Not	Meet	the
		Expectations				Expectations				
Ionic Bonding	34.66%	Did	Not	Meet	the	31.33%	Did	Not	Meet	the
		Expectations				Expectations				
Properties of Ionic and Covalent Compounds	36.00%	Did	Not	Meet	the	34.66%	Did	Not	Meet	the
		Expectations				Expectations				
Carbon & Its Properties	35.33%	Did	Not	Meet	the	30.00%	Did	Not	Meet	the
		Expectations				Expectations				
Organic Compounds	31.33%	Did	Not	Meet	the	32.66%	Did	Not	Meet	the
		Expectations				Expectations				
Mole Concept										
Percentage Composition of Compounds	28.66%	Did	Not	Meet	the	28.66%	Did	Not	Meet	the
		Expectations				Expectations				
	28.66%	Did	Not	Meet	the	30.00%	Did	Not	Meet	the

		Expectations		Expectations
Mean Performance	32.95%	Did Not Meet the Expectations	31.80%	Did Not Meet the Expectations

As reflected in the table, the control group got a mean performance of 32.95% and 31.80% for the experimental group. Both groups' ratings were described as *did not meet the expectations*. In the control group, the ratings are 36.00%, 34.66%, 36.00%, 35.33%, 31.33%, 28.66% and 28.66%. In the experimental group, ratings are 35.33%, 31.33%, 34.66%, 30.00%, 32.66%, 28.66%, and 30.00%. Students in the control group got the highest rating of 36.00% on both Quantum Mechanical Model and Properties of Ionic and Covalent Compounds, and lowest rating of 28.66% for both Mole Concept and Percentage Composition of Compounds. On the other hand, students in the experimental group also got the highest rating of 35.33% in Quantum Mechanical Model and lowest in Mole Concept with a rating also of 28.66%.

These data showed that the learners in both groups may have similar learning experiences and ideas about the topic (Lasala, 2022) presented in Grade 9 Chemistry, thus both had a general low level of performance. The rating on Quantum Mechanical Model and Mole Concept may be attributed to the level of skill of the test questions. In addition, same pretest result was shown in the study of Cantonjos&Janer (2022). The performance level of Experimental Group in Sampling Distribution which is 58% was identical to that of the experimental group. All the respondents scored lower than 75 on the identified topic which indicating that the majority of the students did not meet the expectations.

Furthermore, this finding was consistent with Escultura&Ricafort (2019) investigation of the effectiveness of the Whole Brain Teaching Strategy (WBTS) in teaching waves. He stated that both the experimental group and the control group performed at the same level on the pretest. This implied that prior to the control group's usage of LAS, the two groups might have had comparable levels of knowledge and expertise in the subject.

TABLE 3
Difference between the Pretest Results of the Control Group and Experimental Group

Statistical Basis	Statistical Analyses
Level of Significance	0.05
Degrees of Freedom	58
Critical Value 2.004	
Computed t-value	0.69
Decision on Ho	Do not Reject
Conclusion	Not Significant

Table 3 below presents the difference between the pre-test results of the control group and the experimental group. It demonstrates that the computed t-value was 0.69, which is lower than the critical value of 2.004, at a 0.05 level of significance and 58 degrees of freedom. Because of this, the null hypothesis cannot be disproved. As a result, there is no significant difference between the experimental group's pre-test results and those of the control group. This result indicates that the pre-test performance of the two responder groups was comparable.

The study carried out by Fortuno&Ricafort (2020) highlighted the same pretest result, inferring that the two groups of respondents may have the same experience in the previous grade level since they equally performed in the pretest. Low levels of performance on the pretest may be anticipated given that the learners don't yet have a foundational understanding at the lower grade levels of the seven topics in Chemistry covered in this study. The similarity in performance between the two groups may also be explained by other factors. One of these is that they have previously received instruction from the same teacher via printed modular distance learning, from which it may be inferred that they may have had a similar level of experience.

TABLE 4
Performance of the Control Group and Experimental Group in the Posttest

Topics	Control Group		Experimental Group	
	Rating	Description	Rating	Description
Quantum Mechanical Model	77.33%	Did Not Meet the Expectations	90.00%	Very Satisfactory
Ionic Bonding	76.66%	Fairly Satisfactory Did Not Meet the Expectations	87.33%	Very Satisfactory Satisfactory
Properties of Ionic and Covalent Compounds	71.33%	Did Not Meet the Expectations	84.66%	Very Satisfactory
Carbon & Its Properties	68.66%	Did Not Meet the Expectations	89.33%	Satisfactory
Organic Compounds	65.33%	Did Not Meet the Expectations	84.66%	Very Satisfactory
Mole Concept	64.66%	Did Not Meet the Expectations	85.33%	Satisfactory
Percentage Composition of Compounds	61.33%	Did Not Meet the Expectations	80.00%	Satisfactory
Mean Performance	69.33%	Did Not Meet the Expectations	85.90%	Very Satisfactory

As reflected, ratings of learners in the control group along the seven topics are 77.33%, 76.66%, 71.33%, 68.66%, 65.33%, 64.66%, and 61.33% with a mean performance of 69.33%. In the experimental group, ratings are 90.00%, 87.33%, 84.66%, 89.33%, 84.66%, 85.33%, and 80.00% with a mean performance of 85.90%. Mean performance of the control group was described as *did not meet the expectations* while *very satisfactory* for experimental group.

There was an increase in the mean performance of both groups of respondents after attending a traditional face-to-face class which means that the method utilized in teaching is still effective. However, when compared to the control group, it is evident that most of the students in the experimental group performed at a passing level on most of the topics. This suggests that employing LASs may have significant impact on their comprehension of concepts and ideas in the Chemistry subject.

This finding can also be strongly supported by the findings of the study by Lapinid (2021), which found that while using self-paced learning modules is effective in improving student performance, it can also be deduced that using contextualized learning modules and Learners Activity Sheets may be helpful in augmenting the difficult learning competencies that students may encounter during the delivery of the most essential learning competencies. Additionally, Cabardo's (2014) study, Effectiveness of Grade 8 Enhanced Learning Materials in Science for the Open High School Program in the K to 12 Basic Education Curriculum, supported these results by showcasing a significant difference in the performance of OHSP students using the Learning Materials of DepEd and the Enhanced Learning Materials in Grade 8 Science on the pretest and posttest. This is also similar to the result of the respondents' posttest for English achievement after using the LAS. The posttest scores after utilizing this material showed a significant improvement, according to the data (Lacsa, 2022). The findings from both studies indicate that using learning activity sheets (LAS) may have helped students perform better.

TABLE 5
Difference between the Posttest Results of the Control Group and Experimental Group

Statistical Basis	Statistical Analyses
Level of Significance	0.05
Degrees of Freedom	58
Critical Value	2.004
Computed t-value	3.03
Decision on Ho	Reject
Conclusion	Significant

Table 5 shows the difference between the posttest results of the control group and the experimental groups. With 58 degrees of freedom and a 0.05 level of significance, the estimated t-value of 5.57 is greater than the critical value of 2.004 as shown. The null hypothesis is rejected as a result. Hence, the results of the posttest for the experimental group and the control group differ significantly from one another. This result implied that the students in the experimental group performed better than the students in the control group. As shown earlier, the students in the experimental group obtained a higher mean performance than in the control group. The significant improvement in the performance of the students may be attributed to the use of developed LASs in Chemistry. As observed during the conduct of the lessons, students who used the LASs were more engaged and active in the normal face-to-face classes.

Based on unstructured interview with the students, most of them said that they enjoyed working on the activity sheets since they are able to learn what they have missed to comprehend during the face-to-face lesson. They are able to master the topic being discussed using these resources. Some of them also stated that these materials made it easier for them to review the lesson the teacher had previously delivered.

This result in posttest is in consonance to the study of Fortunato&Ricafort (2020) wherein they revealed that there is also a significant difference between the test performances of the students in the experimental and control group when they are exposed to different methods of teaching. Additionally, the same results from Montero's (2022) investigation were also found, where the treatment group's post-test mean score is higher than the control group's post-test result. The conceptual understanding of the students in the control group and treatment group significantly differed; as a result, it is recommended that further research be conducted in order to create and develop the worksheets for science learning competencies.

With the help of the developed LASs, the academic performance of the students in the experimental group may have improved better. It demonstrates how the LASs assisted students in better comprehending and remembering knowledge in a different topic in Chemistry including the quantum mechanical model, ionic and covalent bonding, and the carbon & its properties. This proves that despite being crafted for distance learning due to pandemic, LASs are also useful supplemental materials that can improve the performance of the students.

V. CONCLUSION

Based on the result of the study, the Learning Activity Sheets (LAS) were used to support the traditional face-to-face Grade 9-Chemistry class. It was found out that the students in the control and experimental group have similar performance before the they attended classes. After the experimental group have been treated with LASs, they performed better than the control group. The results showed a significant difference between the students' performance in the posttest. Learners have improved their level of performance however when compared statistically, learners in the experimental group who used the intervention performed better. Therefore, the LASs is effective in improving the performance of the students in Grade 9 Chemistry.

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