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Original Research Article

Effectiveness of supplementary modular learning materials to grade 12 students in science, technology, engineering, mathematics track in stoichiometry

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One of the ways to help the learners achieve success in learning is through giving support aids made by the teachers to understand and apply learning in their daily life with the use of supplementary modular learning materials. This study aimed to investigate the efficacy of supplementary learning materials in stoichiometry and find out if there would be a significant difference in the performance of the students using the developed supplementary modular learning materials. There were thirty Grade 12-STEM students involved in the study under the control group (DepEd printed module) and experimental group (Supplementary modular learning materials) in the pre-test and post-test. T-test and matched randomization were employed to test the significant difference in the test results. The pre-test mean score results showed that there were no significant differences between the two groups that remark moving towards mastery. The post-test mean score results showed that there would be a statistically significant difference between the two groups where the experimental group had a larger mean score with remark of closely approximating mastery compared to the control group remaining in moving towards mastery. Still, both modules contributed to increase the academic performance of the students but under the supplementary modular learning materials gave a positive impact in mastering the least learned competencies of the students. This implies that supplementary modular learning materials can be utilized as instructional materials during the distance learning process as effective learning tools. Thus, the school may conduct webinars or seminars, training, programs and activities that will enhance more skills of the teachers in crafting supplementary modular learning materials.

Keywords: DepEd Modules, intervention, least learned competencies, stoichiometry, supplementary learning materials

INTRODUCTION

In the contemporary world of educational reform, teachers were mandated to possess and emanate the 21st Century Skills with the use of Information and Communication Technology (ICT) that would help deliver each learning competency to the learners (Jimenez, 2020). Based on the K to 12 Curriculum, (2013) there had been a shift in the paradigm of learning from teacher-centered learning to student-centered learning (Tahun, 2014). It highlights that

students who have passed the minimum criteria of mastery learning should be provided with enrichment programs while the others who have not passed will get remedial programs (Llego, 2020). These two programs were essential in mastery learning as they help students based on their needs. However, because of no face-to-face classroom contact time, students encounter difficulties to get enrichment or remedial programs (Luz, 2020). Thus, teachers were required to develop alternative learning materials and instructional devices to help facilitate teaching and learning processes (Ronda, 2020).

In this new paradigm, students were expected to take charge of their own learning or in other words, they were targeted to develop autonomy in learning that they should be active in searching and show a lot of initiative in learning, in terms of what they would learn, how they would learn, and how they would assess their own learning (Nunan, 2018). According to Deslauriers, (2019), it is important to ensure that neither teachers nor students were fooled into thinking that lectures were the best learning option. By this, the students might not have any more responsibility for their own learning. They might become too dependent on what the teacher would be feeding them (Ekantini et al., 2017). It was supposed to be expected that the students should be active when it comes to their learning. They should not remain passive and wait until what is being taught by the teacher (Naval, 2014). That was the reason why the Department of Education released a Deped Order No. 32 series of 2020 that learning must continue by giving engagement service of learning support aids such as Alternative Learning Resources or Supplementary Learning Materials that could gradually improve and independently process learning skills to the students as an effective way to cater their needs and to guide them to become active when it comes to learning amidst the pandemic. By this, the students would be able to apply the learned concepts in real life (William, 2017).

Development of Supplementary Learning Materials (SuppMats) are alternative learning materials which are initiated by the teachers in motivating them for promotion and giving them a way to contextualize materials for different regions and diversity of learners (Modesto, 2019). This paves the way for localized devices that suit well to the specific types of learners. Creation of SuppMats gave opportunities to teachers to be motivated to become a writer, illustrator and layout artist to their own developed materials (Jimenez, 2020). The Schools Division in Central Luzon, Philippines started this initiative to teach teachers on how to develop materials for learners and give them chances to gain points from being an author/ writer of their own developed materials (Csee and Frie, 2020).

Developed Supplementary Learning Materials are an additional or alternative printed or non-printed materials used for both distance learning and face-to-face class to promote motivation and to help the students to master competency-based skills on Most Essential Learning Competencies (MELC's) which were not developed during making of Alternative Learning Modalities (ADM) known as DepEd modules (Llego, 2020). These are an intervention material for the students who have difficulties in answering their alternative learning modules to enhance the academic achievements of students performing low in the field of General Chemistry (Utami, 2016). It would increase and deepen students' skills in manipulating, thinking, understanding and observing.

Due to this Coronavirus or COVID-19 global health outbreak where in fact the educational system is unexpectedly affected and temporary shutdown, from the month of March to October 2020 (Aristovnik, 2020). Many debates and issues had been subjected in pushing of reopening of classes in school year 2019-2020 despite the pandemic to secure that no students left behind while parents impose curiosity of trying how remote learning is going on (Magsambol, 2020).

According to Bernardo, (2020) Imposing remote learning poses a lot of challenges in every Filipino student. Buying gadgets such as laptops or computers, tablets or android phones and securing a fast internet connection as well as the stability of current which cannot something Filipino parents cannot afford to produce for their children because many of their livelihoods were lost due to the pandemic.

Promoting flexible learning takes an opportunity to reshape the ways in how to teach the children/students amidst Covid-19 (Huang et al., 2020). This means that the learning programs are created based on the capacity of the students, schools, community or locally and was anchored on theories. This study was anchorage in three (3) theories. The first theory was constructivist learning theory (Bruner,1990). Lamon (2020) stated that constructivist learning theory believed that prior knowledge impacts the learning process. In trying to solve novel problems, perceptual or conceptual similarities between existing knowledge and a new problem can remind people of what they already know (Whitehead, 1947). This was often one's first approach towards solving problems. Information not connected with a learner's prior experiences will be quickly forgotten (Terada, 2017). In short, the learner must actively construct new information into his or her existing mental framework for meaningful learning to occur (McLeod, 2019). This theory was also supported by the schema theory which pointed out that schemata provided a form of representation for complex knowledge and that the construct provided a principled account of how old knowledge might influence the acquisition of new knowledge (Pankin, 2013).

The second theory that serves as an anchorage of this study was the Collaborative Learning Theory. Neff (2014) stated that collaborative learning theory was rooted in Lev Vygotsky's (1978) idea of Zone of Proximal Development. Here, learners rely on one another to accomplish tasks that they otherwise wouldn't be able to complete individually. Collaborative learning was key for developing critical thinking skills, which suggested that students retain more information when working in groups (Roselli, 2016). It

involves peer-to-peer learning that fosters deeper thinking with the help of their parents or guardians, brothers, sisters or family member, neighbor or with the use of facebook messenger (Johnson, 2018). It also suggests that group learning helps students develop their higher-level thinking, oral communication, self-management and leadership skills. Students also have the opportunity to build upon their leadership and organizational skills (Cornell University's Center for Teaching and Learning (2018). The present study is also aligned with this theory as this employed collaborative way of learning among the STEM students in the General Chemistry subject.

Lastly, the theory of Multiple Intelligences (Gardner, 1983) in which teachers must be sensitive to cater the needs of the learners. In making learning materials, it must consider the various activities that suit their individual differences, to deepen their learning skills and abilities. Probably from this developed Supplementary Learning Materials could cater the needs of the students. In his theory, teachers should be considered the Multiple Intelligences of learners because they have different intelligences which others don't have (Mbuva, 2003). That's why teachers developed intervention materials to deepen the learning skills and abilities of the learners due to their individual differences (Winarti, 2019). Confucius circa 450BC, stated that "I hear and I forget, I see and I remember, I do and I understand."

In accordance with the DepEd Order no. 18, s.2020, in which flexible distance learning is a delivery modality where student-teacher learning takes place in geographically remote instructions opted by the Division of Agusan del Sur. It could be Online Distance Learning, Modular Distance Learning (MDL), and Blended Learning (TV/Radio-Based Instruction). The Modular Distance Learning was opted by most of the schools in the said Division as well as in Sibagat National High School of Home Industries (School Implementation Plan (SIP), 2020). Based on Student's feedback form consolidated, (2020) some students had difficulties in answering their modules because they did not have other resources or gadgets to be used that would make them bored, thus the students' achievement in this field is low. The School Monitoring Evaluation and Adjustment (SMEA, 2020) Quarter one presented that most of the students gathered the least learned competencies in the following: determine the molar mass of elements and compounds (STEM_GC11S-Ie-28); calculate the mass of a given number of moles of an element or compound or vice versa (STEM_GC11S-Ie-29); calculate the mass of a given number of particles of an element or compound or vice versa (STEM_GC11S-Ie-30).

The researcher developed intervention materials known as Supplementary Modular Learning Materials (SuppMatts) to determine the level of self-efficacy of the students in using Supplementary Learning Materials; ascertain the academic performance of the students in using DepEd printed modules compared to the developed supplementary learning materials ; and evaluate the effectiveness of of supplementary learning materials in stoichiometry. It underwent on the three stages: planning and development, validation and teaching activities as shown in Figure 1. In the planning and development stage, the researcher determined the least learned competencies from the Most Essential Learning Competencies (MELC's) of the learners based on the SMEA 2020 results and simplified the contents involved in developing supplementary learning materials. It also presented an explicit intervention to the least learned competencies in crafting the intervention materials such as supplementary learning materials prototype I- draft then the revision process. Next stage was validation. Their suggestions and comments were considered and taken into account to point out the strengths and weaknesses of the developed materials. This showed the finalization of the prototype II. Lastly, the teaching activities showed that all participants of the study underwent pretest. These participants would group into two: experimental group used the developed supplementary modular learning materials and the control group used DepEd module. All participants underwent post-test. The result of the post-test was the basis on the effectiveness of the developed supplementary modular learning materials. The whole process was shown below.

METHODOLOGY

Research Design

This study employed pre-test – post-test control group experimental design. Figure 2 below illustrates the pre-test-post-test one group design. This was utilized due to the fact the researcher wanted to determine the effectiveness of supplementary learning materials particularly on the mastery level in the pre-test and post-test. It was a pretest – posttest control group experimental design in the sense that the researcher had utilized the Senior High School-STEM section. The STEM section had been a matched randomization group which had a first group and the second group. To determine the experimental group and a control group, the tossing of coin was done.

Participants of the Study

The Table 1 below shown experimental and control group participants of the study were the 30 students of Grade 12-Senior High School-STEM taking the General Chemistry Subjects. There were 9 males (30%) and 21 females (70%). The research used matched randomization to group the section into half, the first group and the second group using their previous grade in General Chemistry. The two groups underwent pretest and got the t-Test to show if the group was significantly different or not. Using a toss coin, the tail was assigned as an experimental group exposed to developed supplementary Learning Materials and the head was for a control group using the usual way of delivering

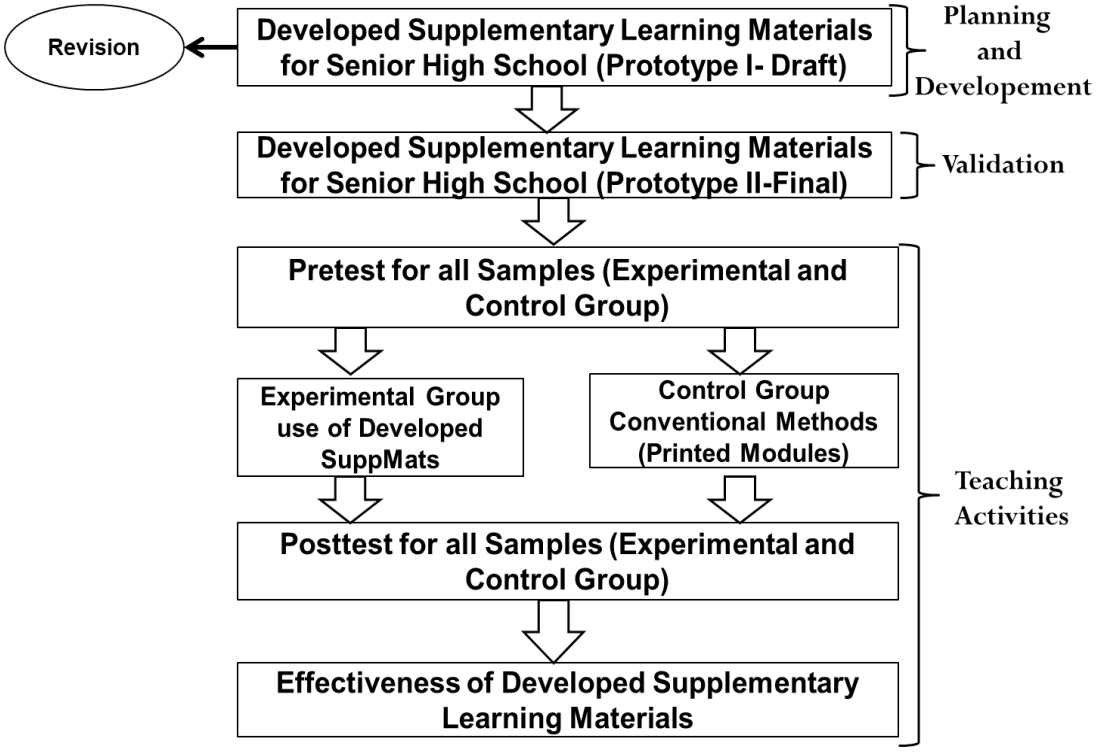

Figure 1: The Research Paradigm of the Study

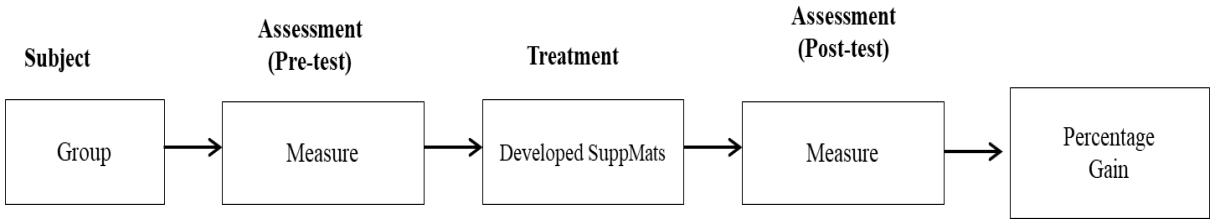

Figure 2: Pretest-Posttest Experimental Design

Table 1. Experimental and Controlled group Participants

GROUPS	FREQUENCY
Experimental	15
Controlled	15
Total	**30**

the distance learning in DepEd modules. The experimental group and control group has 15 participants.

Research Instrument

There were four research instruments used in this study, namely: (a) Learning experience and attitudes towards the subject survey, (b) DepEd modules for distance learning, (c) Developed supplementary learning materials, and (d) Crafted pretest and posttest. The first instrument was learning experience and attitudes towards the subject survey instrument was adopted from the study of Lau, 2017 but there were items that were added and revised in order to fit within the context of the study. In this questionnaire, questions one (1) to eight (8) assessed the extent of students' enhancement in learning. And questions nine (9) to fifteen (15) assessed the extent of students' positive attitude towards the subject matter. Since revisions

happened, this instrument had been subjected to validation which was done by two (2) experts from the academy and two (2) master teachers or teachers teaching Science for at least 5 years. The second was the DepEd Modules for Distance Learning produced by the DepEd central office and is generally used in all over the public schools in the Philippines as unified modules for distance learning and underwent quality assurance. The third was the Developed Supplementary Learning Materials. This instrument, crafted by the researcher who was a teacher- made supplementary learning materials, as innovative for the distance learning in a new normal. This instrument was already validated by three (4) experts from academe; one (1) language editor a teacher teaching English for at least 20 years, one (1) Science Teacher III teaching for at least 20 years and two (2) master Teacher teaching Science for at least 5-10 years for content validity. This crafted Supplementary Learning Materials was adopted by the National DepEd Central office which underwent the process of Quality Assurance for more development such as language editing and content validation by the DepEd Central Office experts. Last, the crafted pre-test and post-test. This instrument was a teacher – made pre-test and post-test with thirty (30) total items. The test would cover the competencies of the subject General Chemistry in the first semester. This had been validated by two (2) experts from the academe and two (2) master teachers or teachers teaching Science for at least 5 to 10 years. To measure the reliability and validity of this instrument, the researcher conducted a pilot testing at another school that offers a STEM track. Then underwent exploratory factor analysis to analyze the constructed validity and correlations of items since the questionnaire were multiple choice, then Cronbach alpha for internal consistency and reliability.

Data Gathering Method

Before the data gathering process, the researcher asked permission from the schools' division superintendent thru the school principal. This was done through writing. The participants of the study filled up the informed consent and assent forms. The main goal of this study was to evaluate the effectiveness of Developed Supplementary Learning on new normal education in the performance of Grade 12 STEM student on their General Chemistry Subject.

Before the field implementation of the study, the instruments and materials had undergone four stages: Planning, Development, Language Editing and Content Validation. In the planning stage, the researcher determined the least learned competencies from the Most Essential Learning Competencies (MELC's) of the learners based on the SMEA 2020 results and simplified the contents involved in developing supplementary learning materials. In the development stage, researcher presented explicit intervention to the least learned competencies in crafting the intervention materials such as supplementary learning materials which includes the subject matter, the least learned competencies aligned with MELC's, test questionnaires and simplifying contents based on the students' learning experiences and attitudes towards the subject. In the Language Editing stage, the English teacher gave comments or suggestions regarding the correct grammar, punctuations, conjunctions and other rules, regulations and agreement in English Language. They also corrected or checked the proper words or simple words that were easily understood by the students based on crafted supplementary learning materials. Then it went back to the author/researcher for editing. The Content Validation stage was considered as knowledge, comments, and suggestions of an expertise. Their suggestions and comments were considered and taken into account to point out the strengths and weaknesses of the developed materials. Then the teaching-learning activities process in which a survey instrument with students' learning experiences and attitudes towards the subject would be validated by the expert. This would be done in order to determine whether the Developed Supplementary Learning Materials had a positive effect on them or had none. All STEM students who enrolled in General Chemistry 1 would take the survey during the distribution/retrieval of modules. Since the instrument had only 15 items, the students would be given 30 minutes to answer. The data to be gathered would be tallied and interpreted.

The students' mastery level would be determined through administering pre-test and post-test during the distribution/retrieval of modules in their given schedule. The scores would then be recorded and would be used to compare whether significant difference between experimental group and control group exists. This also tells whether the developed supplementary learning materials had a good effect towards students' performance in distance learning modalities in the new normal.

Statistical Treatment

The Table 2 below shows the mean rating and its interpretation of the study and it was utilized by the study of Lau (2017). The mean rating was used to determine the level of learning experiences and attitudes of the students towards the subject.

The Table 3 below presented the Mean Score and Mean Percentage Score and its verbal description to determine the mastery level of the students based on pretest and posttest given. The equivalent verbal description of the mean percentage score is determined using the following scale and descriptive rating observed in the National Achievement Test (Fernandez, 2013).

Matched Randomization was also used to group the small sample size into two equal groups: the experimental group and the control group. All samples' average grades in General Chemistry were arranged from highest to lowest and randomly paired the highest and lowest into the first group and also in the second group until the participants have equally distributed by the group and the tossing of a

Table 2. Mean Rating and its Interpretation

Mean Rating	Interpretation
4.50-5.00	Outstanding
3.50-4.49	Very Satisfactory
2.50-3.49	Satisfactory
1.50-2.49	Fair
0.45-1.49	Poor

coin were used to determine which group is the experimental and which group is the control. The experimental and the control group underwent the T-Test to indicate if the groups were equivalent in terms of their academic performance in chemistry before administered.

RESULTS

On determine the level of self-efficacy of the students in using Supplementary Learning Materials

As presented in Table 4, the results of the level of self-efficacy of the students in using Supplementary Learning Materials with the references found in Table 2 for the interval and interpretation of mean score to determine the level of learning experiences and attitudes of the students towards the subjects.

Based on the table 4 shown above, the highest mean score with the rating of 4.73 of the students supported that the internet connections and gadgets are very essential in today's learning since majority students of both groups rated it as "Always". It revealed that the majority of the students affirmed their readiness to use the Supplementary Learning Materials for their learning with the help of digitalized technology and internet access when no one can cater their queries in today's distance learning. On the other hand, the lowest mean score with a rating of 2.73 rated as "Sometimes" in the control group and 2.13 interpreted as "Seldom" in the experimental group of the students doubted that they discussed the concepts with their elder brothers and sisters or parents.

Ascertain the academic performance of the students in using DepEd printed modules compared to the developed supplementary learning materials

The Table 5 below with the references on the Table 3 in the previous page for the mean percentage ranges and its verbal description to determine the mastery level of the students based from pre-test and post-test given.

Table 5 shows that the academic performance of the students in both modules shows an average of 70% in their Pre-test results with the remarks of moving towards mastery. However, when the post-test was conducted with the intervention applied for the group with supplementary learning materials, there is a large increase in their scores. The control group having the DepEd printed modules still shows an increase of the average score with 81% but still having the remarks of moving towards mastery. Moreover, the experimental group with the supplementary learning materials shows an increase of 91% with the remarks of closely approximating mastery.

The academic performance of the students was gradual, measurable assessment includes the test score and the outcome based on a certain subject that indicates the extent to which a student has achieved. To assess the differences in academic performance of the students before and after the administration of the instrument, a T-test for pre-test and post-test was conducted. This is to examine whether there were significant differences in academic performance of the students in pre-test and in post-test after using the interventions. Table 6 below shows the results of the academic score of the students in pre-test and in post-test.

Table 6 shows the T-Test results for the pre-test and post-test. It is presented above that the pre-test results of the two groups have shown no significant difference since both indicators have the same mean score of 70% and have a p-value of 1 greater than 0.05 ($p>0.05$). This means that both groups had the same academic performance before the supplementary learning materials had been administered. The post-test, on the other hand, has a highly significant difference since the two groups indicate a 10% difference with p-value of 0.00 ($p<0.05$) . It means that the two groups have a higher difference regarding the data variable after implementing the supplementary learning materials.

Evaluate the effectiveness of supplementary learning materials in stoichiometry

Table 7 shows the result of students' performance in the pre-test and post-test. In the Control group, the pre-test-post-test result in p-value is 0.000 ($p<0.05$) and its statistical result is -9.38 that is highly significant. On the other hand, the pretest-posttest results of the experimental group present that the p-value is 0.000 ($p<0.05$) and its statistical results is -10.63 with remarks of highly significant. It means that both control and experimental group are highly significant but students under the experimental group with supplementary learning materials have larger academic scores compared to students with

Table 3. Mean Score and Mean Percentage and its Verbal Description

Mean Percentage Ranges	Verbal Description
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

Table 4. Mean Scores of Learning Experiences and Attitudes towards the Subjects

Constructs		DepEd Printed Modules (Control Group)		Supplementary Learning Materials (Experimental Group)	
		Mean Score	Remarks	Mean Score	Remarks
1.	I understand the topic when I employ pre-reading.	3.33	Sometimes	3.47	Most of the time
2.	I learn difficult terms/technical terms through internet resources.	3.73	Most of the time	3.87	Most of the time
3.	I find difficulty in answering my activities amidst household chores.	3.53	Most of the time	4.73	Always
4.	I discuss the concept with others through text/call and chat.	2.80	Sometimes	2.80	Sometimes
5.	I clarify confusing items with my teacher through text/call and chat.	3.13	Sometimes	3.13	Sometimes
6.	I value the time in getting modules.	3.67	Most of the time	3.67	Most of the time
7.	I discuss concepts with my elder brothers and sisters/parents.	2.73	Sometimes	2.13	Seldom
8.	I believe the internet and gadgets are very helpful in today's learning.	4.73	Always	4.73	Always
9.	I am becoming an independent learner.	3.53	Most of the time	3.60	Most of the time
10.	10. I am motivated to learn while browsing/reading through the modules.	3.47	Most of the time	4.00	Most of the time
11.	I feel free to ask questions, express doubts and feelings.	3.53	Most of the time	3.47	Most of the time
12.	I approach others positively.	4.07	Most of the time	4.07	Most of the time
13.	My interest in learning the subjects increases while discovering my inclination towards General Chemistry.	3.27	Sometimes	3.53	Most of the time
14.	I am eager to explore more on the subject.	3.53	Most of the time	3.93	Most of the time
15.	I am confident in attending to my modules in General Chemistry.	3.73	Most of the time	3.93	Most of the time

Table 5. Pretest and Posttest Mean Score and Mean Percentage and its Verbal Description

Indicators	Pre-Test		Posttest	
	Mean Score	Remarks	Mean Score	Remarks
DepEd Printed Modules (Control Group)	70%	Moving Towards Mastery	81%	Moving Towards Mastery
Supplementary Learning Materials (Experimental Group)	70%	Moving Towards Mastery	91%	Closely Approximating Mastery

Table 6. T-test for Pre-test and Post-test

Constructs	Statistic	p - value	Remarks
Pre-test	0.00	1.00	No Significance
Posttest	-5.79	0.00	Highly Significant

Table 7. T-Test Pretest-Posttest for Controlled Group and Experimental Group

Constructs	Statistic	p-value	Remarks
DepEd Printed Modules (Control Group)	-9.38	0.000	Highly Significant
Supplementary Learning Materials (Experimental Group)	-10.63	0.000	Highly Significant

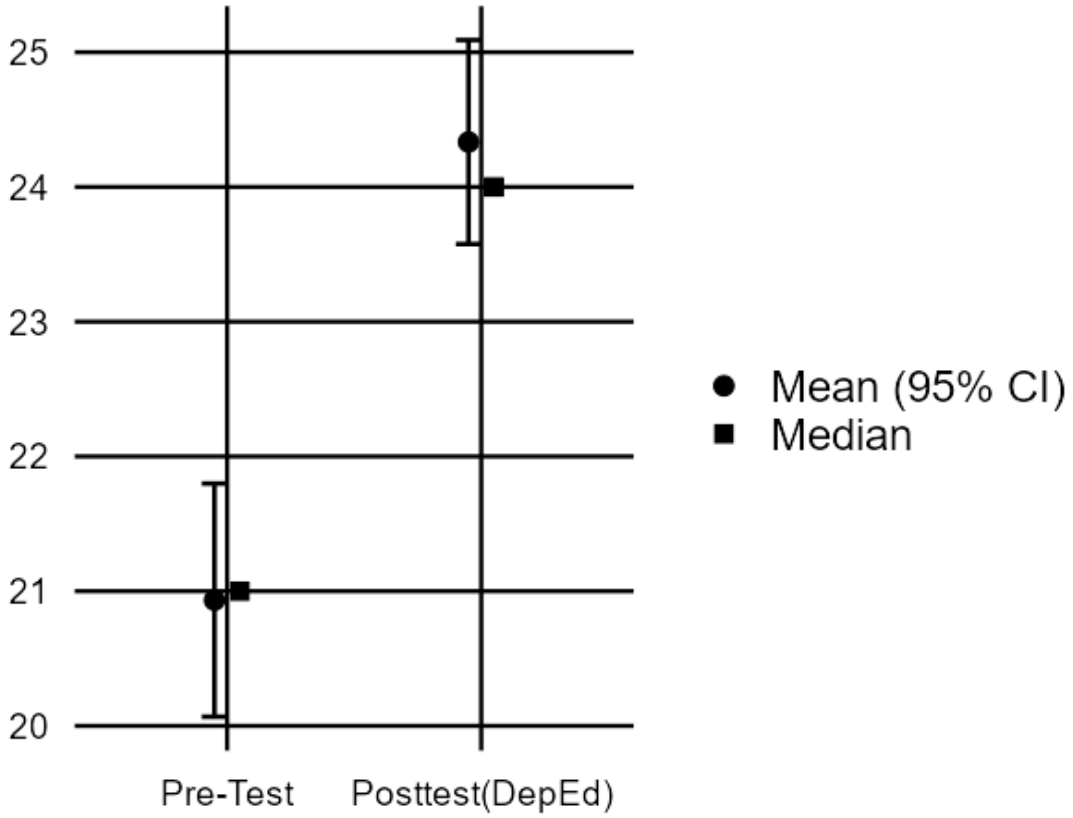

Figure 3: Gain Score Academic Performance using DepEd Printed Module

conventional way of distance learning. This means that the experimental group with supplementary learning materials is more effective than those on the controlled group.

As a result, the post-test in the supplementary learning materials reveals that the academic performance of the students has increased. It shows that there was a significant difference between the pretest and posttest of the supplementary learning materials. The utilization of supplementary learning materials was effective intervention materials that made students obtain better scores in the post-test

The Figure 3 above shows a plot of variation of their gain score academic performance using DepEd printed module. The values of the pre-test scores on the DepEd printed modules are within the range of 20 to 21.9. It presents that the median is slightly higher than the mean which may indicate that the scores are low and below the average. Moreover, the post-test scores of the printed modules are within the range of 23.5 to 25.1. The median is lower than the mean and may reveal that the scores are above the average threshold. The large range of values also signifies the scores of the participants vary from the mean. The "I" in the plot indicates the variation of the scores of the students. The longer the "I" the more varied the scores and the shorter the "I" is the lesser variation of scores.

Figure 4 shows the results of the experimental group

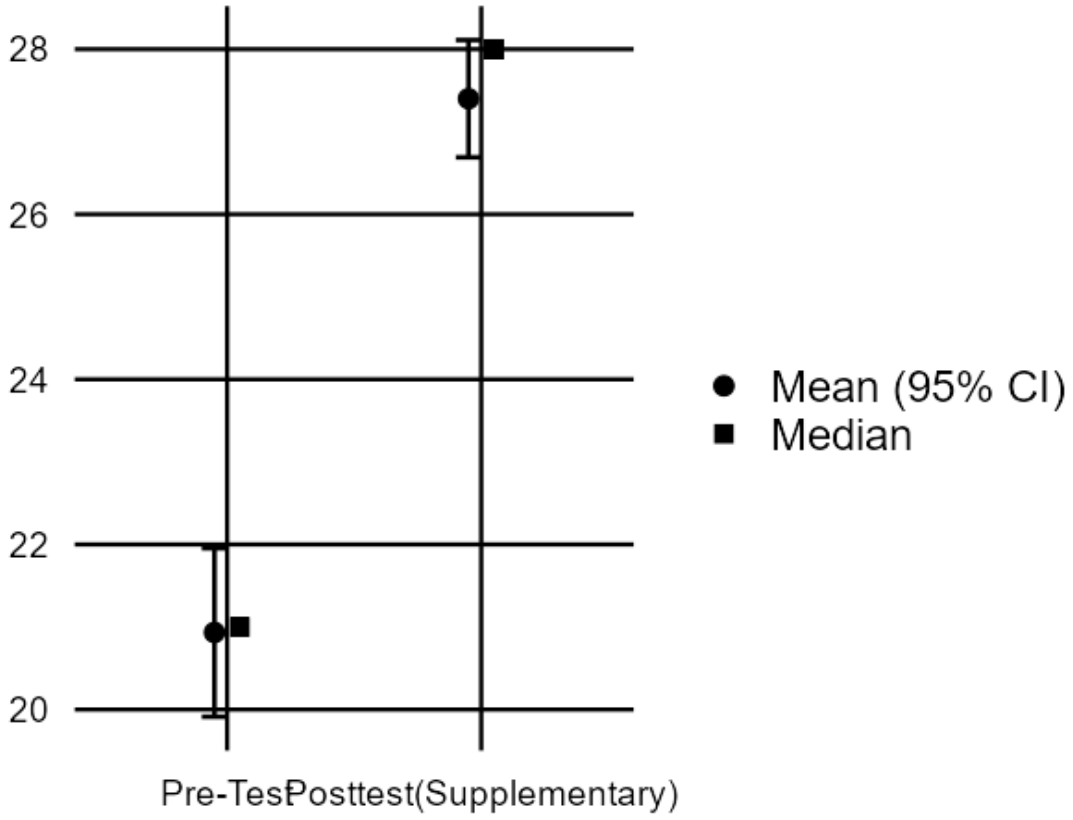

Figure 4: Gain Score Academic Performance using Supplementary Learning Materials

with the supplementary learning materials are way more different from DepEd printed modules in the posttest only. The score in the pre-test is the same as the control group (DepEd Printed Modules) which is within the range of 20 to 21.9. The posttest shows a more substantial increase from the posttest with the range of approximately 27 to 28. The median is way above the mean which may indicate scores are way above the average. . The "I" in the plot indicates the variation of the scores of the students. The longer the "I" the more varied the scores and the shorter the "I" is the lesser variation of scores.

The plot above implied that the Supplementary Learning Materials significantly improved the academic performance of the students in learning Chemistry concepts based on the most essential learning competencies measured. It reveals the result above that the use of Supplementary Learning materials as instructional materials in distance learning significantly affects the progression of student's learning because it assists the learner's achievement with regards to their performance. It stimulates their motivation to learn independently.

DISCUSSION

The level of self-efficacy was defined as one's belief in the ability to perform some action (Bandura, 1997). It is one of the most widely researched topics in management and psychology (Latham and Pinder, 2015). It indicates that self-efficacy was positively related to performance (Sadri and Robertson, 1993; Stajkovic and Luthans, 1998), academic achievement (Multon, Brown and Lent, 1991), self-regulated learning (Sitzman and Elly, 2014), health outcomes (Holden, 1991), and other variables (see Bandura and Locke, 2003, for a review of the meta-analyses). As the results above, the students believed that internet connections and gadgets were very essential in today's learning with highest mean rating scores. It relates that the use of developed digitized supplementary learning modules as a teaching and learning media motivated the students to study chemistry independently by themselves with the help of internet access as additional resources and resulted to increase their achievements in chemistry subjects (Situmarong, 2017).

According to Ratnasari (2019) that using internet access and gadgets in the process of independent learning activities were useful to enhance the effectiveness of the learning process of independent learners because they can easily search for solutions to the problems in which they have some doubts regarding the concepts especially in science subjects. Utilization of gadgets in learning played an important role as a source of learning and supported the

process of distance learning to be comfortable, so the creation learning process became effective and efficient so it had improved student learning outcomes.

Based on the study result of Spring, 2012 as cited by Rotas (2020) that the internet usage is increasing rapidly as one of the supports in answering supplementary learning materials in the field of science. Findings also indicated that internet usage has the positive relationship with students' learning as higher of using the internet to support their learning. Majority of the respondents believed that the internet is an important tool to learn in the current way of new normal learning (Obligar, 2021).

The study result revealed that the lowest mean score interpreted as "Sometimes" in the control group and "Seldom" in the experimental group of the students doubted that they discussed the concepts with their elder brothers and sisters or parents. It shows that one of the factors that affects the least learned competencies of the students is because they were not well-guided by their peers, elders, brothers, sisters and parents. Guitart (2018) stated that collaborative learning theory is rooted in Lev Vygotsky's (1978) idea of Zone of Proximal Development. Learners rely on one another to accomplish tasks that they otherwise wouldn't be able to complete individually. It involved peer-to-peer learning that fosters deeper thinking with the help of their parents or guardians, brothers, sisters or family members, neighbors or with the use of social media (Johnson, 2018).

Guiding and parenting the students would give a positive impact to the students' attitude towards the subject matter and enhanced engagement relationship towards the students-parents bonding that fostered the deeper emotions towards one another. It augmented the critical thinking skills of the students and their impressions to increase academic performance in the learning process (Alexander,2019). It is related to the result of Cai, et al, (2019) that the students with the most supportive parents and family members demonstrate a higher academic performance and more positive attitudes towards the subjects than those students with least supportive parents and family members.

Academic performance is the measurement of student achievement across various academic subjects that make several components of academic success. The study results revealed that the academic performance of the students in both modules shows an average mean percentage to their Pre-test results with the remarks of moving towards mastery. However, when the post-test was conducted with the intervention applied for the group with supplementary learning materials, there is a large increase in their scores. The control group having the DepEd printed modules still shows an increase of the average score but still having the remarks of moving towards mastery. Moreover, the experimental group with the supplementary learning materials shows an increase with the remarks of closely approximating mastery. There were effects of the teaching-learning process in new normal education to students' academic performance using modular type of distance learning in Science Subjects. The students had positive perceptions regarding Modular Distance Learning Approach in Science. They agreed that using the modular distance learning approach (MDLA) has little challenges. It also had a positive effect on students' performance in which students performed very satisfactorily which means they had good quality performance (Aksan, 2021).

The findings showed that the students increased their academic performance after they were exposed to DepEd Printed Module. This further showed that they had an improved academic performance considering they learned the concepts independently. It signifies that the printed modular is effective in adapting learning. The mean post-test score is greater than the mean pre-test score; it shows that the exposure to the printed module contributes to the improvement in the academic performance of the students (Torreflenca, 2017). It improved their academic performance in the sense that they are open-minded and flexible in the changes of the environment, they learned not just the specific lesson but also the values in times of pandemic, and they learned how to manage time to follow their schedule (Anzaldo, 2021).

According to Suazo, by 2020 the use of Supplementary learning materials was effective in terms of improving students' performance particularly on the topic pertaining to the least mastered skills. This implies that it can be utilized as instructional materials during the distance learning process as an effective teaching tool in today's new normal. The learners were enjoying and learning as they went along with the Supplementary Learning Materials. In this case, the learners had already developed and improved their least mastered skills. They were able to combine logical ideas and sentences with the use of logical connectors appropriately. These led to the excellent performance of the learners. Aside from this, learners were also able to develop their passion in reading (Cordova, 2019). It signifies that the students with the intervention learning materials such as supplementary modular learning materials could help to increase student's academic achievements (Naboya, 2019).

The pre-test and post-test results above showed that on experimental group with supplementary learning materials performed better than the control group with conventional way of teaching. It concludes that the use of supplementary learning materials as intervention significantly contributed to the mastery of science concepts and the development of science process skills (Alburoto, 2019). Based on the findings of Aranda et al. (2019) that the pre-test performance results of the two groups were equivalent in terms of their academic performance in Chemistry. The post-test with an intervention was higher compared to the post-test result of conventional way of teaching. It corresponded to the findings result of Sinco (2020) that there was a significant difference between the pre-test and post-test performance of the students. The utilization of the Supplementary Intervention Materials was an effective

intervention that made students obtain better scores in the posttest. The supplementary learning materials gave a positive impact in mastering the least-learned competency identified as reflected in the post-test results of the two groups (Arpellida, 2021) . It also signified that the developed chemistry supplementary learning modules were very effective to increase student's academic achievement on chemistry subjects, where the students' achievement on chemistry by using innovative teaching modules were higher than that by using existing text books, and the two methods are significantly different (Jimenez, 2020). Bonitez, 2021 study revealed that there was a significant increase in the performance level of the students after using Supplementary Learning Materials. This proved that the use of it significantly contributed to the mastery of the lesson presented. Supplementary Learning materials should be adapted as an "aid" for instructional materials in teaching to facilitate learning and improve performance of students especially in distance learning. It also showed that the results of supplementary modular learning materials have a significant increase on Mean Percentage Score (MPS) compared to control groups (conventional methods of teaching). Therefore, the use of supplementary modular learning materials for remediation was very effective compared to conventional way of teaching in distance learning (Jamandron, 2020).

In the study of Pasion (2019) reveals that the supplementary learning materials enhanced student's interest, retention of the lessons, increases the performance in the test, deemed instructional materials in upgrading students' retention of the content of the subject as well as sustaining their interest to learn and integrating the lessons in their real-life experiences as they identify themselves with their characters they had related in the various activities. The significant difference of the student's performance in pretest and posttest gave an effective way of teaching. This means that using the supplementary learning materials was an effective way as a remediation for the students who gathered least learned competencies.

It relates to the study of Valencia (2020) that the students don't have any idea in subject matter and they never encounter the learning competencies in the discussions. It signifies that the pretest results of the two groups were the same in terms of their academic performance in science (Peňaflor, 2019). It manifested in the study of Comighud (2020) that the students with supplementary learning materials could increase the level of performance of the students than those with no learning materials. Sinco (2018) reveals that the two groups in pretest have no significant difference this means that they had equivalent academic performance before administered learning materials and on the other hand there was a highly significant difference between the academic performances of the students after implementing the learning materials. The pre-test-post-test performance results further coincide with the findings of Villonez (2018) that there was a significant difference in the pre-test and post-test mean scores of the experimental and control group. The experimental group achieved a better mean gain score than the control group. This pointed out that the use of supplementary modular learning materials in the experimental group significantly improved the performance of the students. It can be concluded that the performance of students in the experimental group was greatly enhanced after supplementary modular learning materials were employed in teaching the lesson. Therefore, the employment of intervention was better and effective than the use of conventional methods in teaching some topic in science. Paras (2019) study revealed that there was a tremendous increase from the result of pre-test to the post-test. Therefore, the modified supplementary modular learning materials were effective in mastering the competency based–skills in Science based on the mean scores in the posttest of the experimental and control groups.

Paspetari (2020) revealed that the use of Supplementary learning materials could help the students improve their academic performance. It also signifies that the students can focus better on course materials and on subject matter or lessons. They can easily remember the lesson because it relies on real-life experiences which the students could relate to. They can also enhance their reading comprehension and can learn independently. It was also found out that there were increasing scores from the pre-test result to the post-test results. In the pre-test result, it is shown that there were equal score results in terms of their academic score. However, in the post-test results, it is shown that the supplementary learning interventions group has a higher score compared to conventional methods of teaching. It means that the supplementary learning intervention materials give impact to increase the level of performance of the students.

According to Aranda (2020) in the quasi experimental pre-test-post-test design, the pre-test results of the two groups were equivalent in terms of their academic performance in Science. The post-test result of the supplementary modular learning materials group was higher compared to the post-test result of the non-supplementary modular learning materials group. Also, a highly significant difference was found between the pre-test and post-test performance of supplementary modular learning materials group after the conduct of the intervention. The investigation revealed that supplementary modular learning materials as an instructional material was effective as remediation to the least learned competencies.

The study results in both control and experimental groups are effective in distance learning, however under the experimental group with supplementary learning materials have larger academic scores compared to students with conventional way of distance learning. This means that the supplementary learning materials were a better way of teaching-learning process that would give better course materials and remedies to the least-learned

skills. It could help students improve their academic performance. It increased the performance in the test, deemed instructional materials in upgrading students' retention of the content and the concept of the topic, sustaining their interest to learn, they become independent learners, enhance their abilities in linguistic that improve their reading comprehension and integrate the lessons in their real-life experiences as they identify themselves with their characters they relate in the various activities (Suarez, 2020).

It supported the findings of Soriano (2020) that the interventions made by localization and contextualization were more effective than those made by nationals because students can relate the topic in terms of their traditions, cultures and practices. It showed that the students with supplementary learning materials as an instructional aid was effective in teaching science to low achieving learners (Aranda,2019). It signifies that developed contextualized supplementary learning materials was very effective in the way that the students gained new experiences and developed into independent, they learned effectively and found the subject matter easy to understand and they became more interested, enjoyed and felt to learn (Adonis, 2019). Developed localized supplementary modular learning materials shows a bigger impact towards the academic performance of the students than the conventional way of distance learning (Sicilia, 2018). It has the potential to accelerate the progress of academic performance of the students the way they learned effectively (Perin, 2019).

Laso (2021) revealed that the supplementary learning materials was an effective way to increase the academic performance level of the students because it becomes more active in learning activities, increases motivation, understanding and for the development of critical and higher-order thinking; and better efficiency of its assessment tools and techniques. It is presented that the supplementary learning materials significantly increases the academic performance of the students thus, the use of it for remediation was a very effective way. The utilization of supplementary learning materials as a remediation tools to enhance the proficiency level of low performing students.

According to Lacbay (2020) that the supplementary learning materials are designed to help students improve their critical thinking skills, problem-solving and intellectual skills that would be based on the real-life situation to become independent learning. It is used as tools for a better understanding of the lessons and that the contents are very evident and curricular valid, which would become an effective way in teaching and learning process. The use of supplementary learning materials in the learning process would foster the creativity and productive thinking abilities and would create an active, innovative and positive impact in the learning process (Astalini et al., 2020).

Supplementary learning materials would be needed to support students having low performing grades and the students who were working. It supported their learning activities that made them motivated and interested in answers in independent learning. It significantly improved the student's outcome that made this instrument effective most especially in distance learning approach (Laza, 2020).

Arcala (2021) revealed that the use of supplementary learning materials was very effective to improve the student's outcomes in learning science concepts and help learners to better understand the concept of the subjects. Using supplementary learning materials signifies that the teachers are defined as a facilitator of learning because there is less supervision of the teacher for the students becoming independent on his/her own learning (Castrover, 2019).

Brun (2019) stated that the use of supplementary learning materials can make a difference in students' concept of understanding, consistency representation in Chemistry subjects and can make them more aware of the learning process. Through this, it enhanced the learning style and abilities of the students that would be highly recommended in science subjects since it is an effective way to improve the academic performance of the students as well as their scientific attitudes towards the subjects (Masteranon, 2018).

It is also supported by the findings of Teta (2017) that the supplementary learning materials improved the academic score of the students compared to the conventional way of teaching. It presented that the supplementary learning materials enhanced students' thinking ability skills, understood the topic comprehensively, knew how to solve problem by his/her own and improved their reading comprehension skills. It reveals that the supplementary learning materials were highly effective in the learning process most especially in the distance learning approach (Dejen, 2019).

It supports the study of Dangle (2021), the DepEd printed module is effective in today's fast transition educational learning time. The students engaged themselves in learning concepts presented in printed modules. They developed their sense of responsibility in accomplishing tasks and they progressed on their own on how they learned and were empowered (Ambayo, 2020). Because of the fast transition of the educational system due to the pandemic, everyone encountered the challenges one of these was adjusting to a new normal education. This was one of the effective ways to continue the education so that no one will be left behind. DepEd printed modular gave benefit even with less administration of the teacher where teachers save their voices. It bested the performance of the students subjected to a conventional classroom that required the teacher's presence all the time Bernardo (2020).

As stated by Aranda et al. (2019), that the supplementary modular learning materials have a highly significant difference between the pretest and posttest. It reveals that the Supplementary Modular learning materials were effective as an intervention in distance learning approach. It manifested to the study of Alburoto,(2017) that the use of effective intervention such as Supplementary Modular

Learning Materials significantly contribute to the mastery of Science concepts and the development of science process skills. It also developed such skills which will motivate them for self-learning such as study skills, note taking skills, referencing skills etc. (Vapulus, 2018). It provided all functional in the conventional situation such as guiding, motivating, explaining, provoking, reminding, evaluating progressive learning, discussing answers to questions and enriching students with his/her experience (Karki, 2018). Thus, the use of supplementary learning materials was a specific strategy and effective way in implementing individualized instructional materials in distance learning (Dejene, 2019).

Conclusion

The findings of the study led to the conclusions that the students believed that the internet and gadgets were very helpful in today's distance learning. It also concluded that the academic performance of the students who were using supplementary learning materials had a larger score compared to the students who were using conventional methods of teaching. It also concluded that both groups showed equivalent percentage score before administering the supplementary learning materials that had no significant difference. However, after implementing the supplementary learning materials, there would be an increasing mean percentage score that had significant difference. This implies that both modules, whether Deped printed modules or supplementary modular learning materials were the effective way to increase the academic performance of the students. However, students who were using supplementary learning materials had increased a score and improved largely with high points compared to the students who were using a conventional way of teaching. The results could be the basis to help the learners to master the least learned competencies and infer the supplementary modular learning materials to be utilized as instructional materials during the distance learning process as an effective learning tool and an alternative or an intervention or remedies in the distance learning modality.

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Conflict of interests

The author declare that there is no conflict of interests regarding the publication of this manuscript.

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