

**Research Article****EFFECTIVENESS OF SELF-LEARNING MODULES OF ADD-ON SUBJECTS OF THE GRADE 8 STE CLASSES****^{1,3}Arnel A. Julaton, ^{2,3,*}Gerald T. Malabarbas and ³Farina D. Magdaraog**¹Calbayog City National High School, Calbayog City, Philippines²University of Antique, Sibalom, Antique, Philippines³Christ the King College, Calbayog City, Philippines**Received 15th May 2022; Accepted 20th June 2022; Published online 19th July 2022**

Abstract

During the pandemic, the Department of Education used Self-Learning Modules (SLMs) for modular distance learning. The descriptive-evaluative design was used to assess the effectiveness of the SLMs of Grade 8 STE classes in Calbayog City's public junior high schools. Respondents were 8th-grade STE students at public high schools offering STE. A survey questionnaire was used to evaluate the SLM in eight dimensions: learning outcomes, content, resource materials, assessment, learning activities, clarity, cohesion, and feedback. Most STE students were female, at the right grade level, used online learning, and performed well in add-on subjects. SLMs were deemed effective learning materials. Age, sex, and first-quarter performance on SLMs like learning outcomes, learning activities, and assessment showed no significant differences. The evaluation showed no significant differences between learning modalities and SLM dimensions. In contrast, school is not a predictor of SLM's perceived effectiveness among students. Only age and sex correlated to SLM learning outcomes, assessment, cohesion, and resource materials. Since the SLM was evaluated as an effective learning material for add-on subjects in both learning modalities, the researcher recommends that teachers use the SLMs and that DepEd personnel like EPS in Science, school heads, teachers, and the Quality Assurance team continue assessing the SLMs in the STE program to ensure their effectiveness and quality. The researcher proposed a training design on teacher-made SLMs in the STE program using the ADDIE model as a capacity-building activity for teachers in developing and validating SLMs.

Keywords: Learning module, Distance education, Junior high school, Science class.

INTRODUCTION

The World Health Organization (WHO) declared COVID-19 an international public health emergency. On March 8, 2020, Philippine President Rodrigo Duterte issued Proclamation 929, declaring a public health emergency and mandating a communal quarantine. The global epidemic has left everyone despondent. Most people do not know what to do, which route to take, or how to proceed. It was a big shock and changed many elements of life, especially after the government instituted community quarantines across the country (World Bank, 2021). Undeniably, the pandemic has affected education. This global crisis affects schools. Most countries have temporarily closed schools to prevent infection (Tria, 2020). Most have struggled to operate since they must stop. Face-to-face regular classes had to be stopped immediately for everyone's safety, directly affecting the education sector. Last week was filled with remedial classes and exams. They spent the year at home doing schoolwork. Everything was done remotely using phones, texts, social media, the internet, and other online platforms. This situation made submitting requirements and coursework easier. The Department of Education (DepEd) responded by implementing the Basic Education Learning Continuity Plan (BE-LCP), which assures that basic education continues despite the COVID-19 virus' threat to all school workers and students. This scheme ensures teachers can teach safely and students can learn securely. The BE-LCP indicates that education will be given remotely. The Department also evaluates factors that may impede learners' development in distance learning. Because of this, the Department of Education (DepEd) condensed the curriculum and created the Most Essential Learning Competencies (MELC).

Distance learning platforms use internet technology to provide interactive, real-time, or synchronous learning. It is also cheaper than using telephone technology. Online platforms allow teachers to deliver resources electronically, assess students, and give instructional support without compromising safety (Natividad, 2021). DepEd issued Department Order Nos 07, 12, 13, and 14 series of 2020, in the new education normal during the pandemic instructing all basic education institutions to develop their Basic Education-Learning Continuity Plan (BE-LCP) and health and safety protocols. The DepEd BE-LCP establishes distance learning modalities by considering the school's and community's digital infrastructures and learners', parents', and teachers' distance learning capacity. Teachers and students need desktop computers, laptops, tablets, cellphones, and internet access for distance learning. The school's digital infrastructure is key to integrating remote learning. Both the learner and the teacher must have internet access for distance learning. Numerous factors make internet connection difficult, including the school, teacher, and learner's location, where signals can affect connection quality. Because parents' ability to help varies, the teacher must be skilled to minimize its impact on teaching and learning. According to DepEd's National Learner Enrolment and Survey Forms (LESFs), 8.8 million (39.6%) of the 22.2 million enrollees prefer modular remote learning for the coming school year. Meanwhile, 3.9 million students (17.6%) preferred blended learning (which combines many modalities), 3.8 million (17.1%) preferred online learning, and 1.4 million and 900,000 students selected TV-based and radio-based learning, respectively. Many Filipino learners choose modular distance learning due to worries about access to the internet, devices or gadgets, other technology-related challenges, cost, and infrastructure availability to support them (Manlangit, Paglumotan, & Sapera, 2020). However, some schools in the

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Schools Division of Calbayog City have chosen the Online Distance Learning (ODL) modality just like the Science, Technology, and Engineering (STE) program to some public secondary schools in the said division. Moreover, the Bureau of Curriculum Development (BCD) has identified essential learning competencies and streamlined these even further into MELCs, where some parts of the process are decided whether a learning competency is to be retained, dropped, merged, or revised to make it more concise and appropriate for the learner's needs. DepEd's Basic Education Learning Continuity Plan has been simplified to 5,689 MECLs from the original 14,171 as part of the coronavirus crisis, or a 60% reduction in K to 12 curriculum (Gonzales, 2020). Steadfast in its preparation for School Year 2020-2021, the Department of Education (DepEd) will provide Self-Learning Modules (SLMs) with the alternative learning delivery modalities to be offered for various types of learners across the Philippines. Integrating SLMs with the alternative learning delivery modalities (modular, television-based, radio-based instruction, blended, and online) will help DepEd ensure that all learners have access to quality basic education for SY 2020-2021 with face-to-face classes still prohibited due to the public health situation. SLMs and different delivery methods would enable DepEd to ensure that all students receive a quality basic education. To contextualize the SLMs for each region, DepEd created a set for each region, which was printed in July and prepared for nationwide distribution, including learners in coastal and remote locations (DepEd, 2020). In view of the above, the researcher assessed the effectiveness of self-learning modules (SLMs) in add-on subjects of Grade 8 STE students in the public high schools in the Schools Division of Calbayog City as perceived by the Science, Technology, and Engineering (STE) students with the end view of coming up of inputs necessary for the enhancement of the modules.

LITERATURE REVIEW

At the beginning of 2020, schools in many nations were confronted with unprecedented challenges due to the COVID-19 viral epidemic. As a result, the formal school system will not be reopened this academic year in several countries, including the United States (UNESCO, 2020). With the introduction of the learning module, home learning has evolved as a viable alternative to traditional schooling techniques, with online instructions predominating among alternative learning modalities. Modular instruction is more effective in the teaching-learning technique than traditional teaching approaches since students study at their own pace using a modular approach (DepEd, 2020). Self-learning at an unrestricted speed and manner in which rapid reinforcement is supplied to practice exercises, motivating students, and instilling a sense of wonder is the goal (Dizon, de Guzman, Uy, & Ganaden, 2021). In most cases, the modular method helps maximize student involvement in the classroom when it comes to completing the tasks assigned on the spot. The module seems to be the only media capable of instilling students with the ability to work autonomously (Rufii, 2015). Apart from the practical, the module's use can also increase the efficiency and effectiveness of school-based learning, including the efficient use of time, funds, facilities, and staff to accomplish the objective ideally. Moreover, the study also stressed that the developed modules emphasize the process of reasoning, communicating the experiment and practice of reserved, rather than explaining the concept of the material described. In contrast, students prefer and easily understand the

concept of learning when accompanied by examples of real and scientific steps. In this context, Hadiano, Mudakir, and Asyiah (2018) investigated the effectiveness of a module with a scientific approach to the study of biology in senior high school, concluding that the use of a scientific approach to the respiratory system module can improve student learning outcomes with an increased score N-Gain 0.72 and a fairly high category. It is supported by the fact that the scientific approach to Biology module media can improve learning outcomes from an average of 50.1 to 83.2 and that the level of completeness of the minimum criterion value of 77 increased from an average of 11.4 percent to 90.5 percent, indicating that the scientific approach to Biology module media is effective.

In 2019, Sareen studied the effectiveness of self-learning modules on process skills in Science with the study habits of students using a quasi-experimental research method with pretest and posttest nonequivalent group design. The findings of the study revealed that both traditional and self-learning modules are effective in improving students' process skills; however, teaching through self-learning modules is more effective when compared to traditional methods because it results in a significantly higher gain in process skills than traditional methods of teaching, as results also revealed. Castroverde and Acala (2021) conducted a qualitative study that employed the phenomenological research design to determine teachers' challenges in using modular distance learning modality in the different public secondary schools within Tacloban City. The study found that teachers' difficulties were identified based on their planning methods, preparing and distributing modules, monitoring students' learning, checking, evaluating outputs, and providing feedback on their students' performance, among other things. Furthermore, teachers used a variety of strategies to deal with the difficulties that they encountered in the modular distance learning modality, including time management, developing innovative teaching strategies, adapting to the changes brought about by the new normal trend in education, being flexible, providing alternative plans, remaining optimistic and patient, and equipping themselves with the necessary skills for the new normal ways of education, among other things.

According to the study conducted by Llego (2020) on the effectiveness of self-learning modules on achievement among secondary school students, students who were taught using the modular approach achieved higher mean scores than those taught using the activity-oriented approach. To make matters worse, the research conducted by Padmapriya (2015) reveals the effectiveness of the self-instructional module on student achievement among secondary school pupils. Therefore, teachers involved in developing modular packages should receive specialized training in flexible learning from their directors if this is possible. Furthermore, since it has been stated that the modular approach helps maximize student participation in the classroom by completing the tasks assigned on the spot, it is worth repeating. As a result, the students are free to learn in their own way (Sinco, 2020). On the other hand, Amabayon (2020) studied the modular-based approach and students' achievement in Literature. The study revealed that modular instruction is a more effective teaching method when compared to traditional teaching methods since it allows pupils to learn at their own pace. It is an unfettered self-learning panache in which rapid feedback and commentary are provided on practice exercises, stimulating pupils and instilling a sense of inquiry. Additionally, the modular approach

increases the likelihood of student engagement in the classroom to complete the assigned activities on the spot. This research established that modular teaching is a more practical method of instructing university students. Because the modular approach is an unmatched method of instruction, teachers should receive proper training on strategizing and implementing a module in the classroom setting. According to the findings of the Anduyan (2021) study, the effectiveness of blended learning modules is extremely high. It follows from this finding that the content's quality, usability, and potential effectiveness as a teaching tool are all of the high quality. On the other hand, students' self-efficacy is very high, as is their confidence. Students' self-efficacy is evident in most situations when it comes to enlisting social resources, academic achievement, self-regulated learning, self-regulatory efficacy, meeting others' expectations, social self-efficacy, and self-assertive efficacy. According to the findings, the study also found that the module's content quality, usability, and potential effectiveness as a teaching tool all significantly impact students' self-efficacy. Students' self-efficacy increases as a result of the better and more usable module content, as well as the use of an effective teaching tool.

In their study, Solomon and Alforja (2021) assessed the students' performance in PE 8 using different modalities. This study examined pre-and posttest classroom evaluation methods and synchronous, asynchronous, and modular learning styles. The significant difference between the pretest and posttest employing synchronous, asynchronous, and modular learning led to a new school improvement plan. The synchronous group had the greatest mean, followed by the modular group, while the asynchronous group had the lowest mean. The results also showed that the synchronous group of Grade 8 students had the greatest mean score on their pretest. Notably, no differences were between the two tests. The test results were also significantly different between the groups' Pre- and Post-test mean scores. It means that teachers' instructions influence students' achievements in many ways. The students showed a substantial difference between the pretest and posttest. They were higher than their pretest mean scores. After the synchronous group, the posttest was higher. The study concluded that there was no significant difference in module group mean scores among learners whose posttest mean scores exceeded their pretest mean scores. Similarly, the study by Ramos, de Guzman, and Rico (2021) disclosed that The level of academic achievement in Economics before using the SLM was very 'Satisfactory,' and the level of academic achievement after using the SLM was very 'Outstanding,' indicating that the SLM was extremely beneficial and effective. Overall, it was discovered that the characteristics/components of SLM for Economics in terms of paper design and layout, illustration and printing (including color printing), content, presentation, and organization were very evident. According to the study's findings, there is no statistically significant difference between the first quarter achievement of students and the SLM in Economics that was used, as determined by the teachers. According to the evaluation results, there is no statistically significant difference between students' achievement in the second quarter and the SLM in Economics that was used. There is no statistically significant difference between the students' Economics performance in the first and second quarters. Based on the results of the teachers' evaluations, this study developed an enhanced self-learning module in Economics for use by students. Regarding creativity and innovation, the researchers recommend that Social Studies

teachers and department heads prioritize the content feature of SLMs when developing lesson plans. According to Dangle and Sumaoang (2020), teachers encounter various difficulties when implementing modular distance learning. The majority of students are incapable of studying independently. Seventy percent of them struggle to follow the modules' directions. As a result, modules were frequently submitted late, and most response sheets were blank. Teachers believe that students' responses to their modules lack rationality and that mastery of the course is highly improbable. Several of them devote most of their time to assisting their younger siblings in completing their courses. As a result of their lack of orientation, parents cannot support their child or children. Certain parents are unable to obtain a high school diploma. Certain instructors' cell phone signals and connectivity are inadequate. Additionally, instructors must verify and record a great deal of paperwork. While comprehensive online and blended learning appear to be the ultimate goal of education in this new era, Olivier (2020) asserts that they require considerable improvements. Blended learning is a well-established educational strategy in several industrialized countries. It has equipped these countries to deal with the current COVID-19 epidemic. Already, blended learning and teaching strategies have been implemented. On the other hand, schools in other countries must carefully plan a virtual learning solution.

METHODOLOGY

Research Design

The study used a quantitative approach involving a descriptive-evaluative research design since it analyzed the effectiveness of the self-learning modules as perceived by the student-respondents.

Respondents and Sampling Technique

The study's respondents were the Grade 8 STE students of the three (3) identified public high school schools: Calbayog City National High School, San Policarpo National High School, and San Joaquin National High School. These were the only respondents because these schools offered the Science, Technology, and Engineering program among the public high schools in the Schools Division of Calbayog City. Table 1 presents the frequency and percentage distribution of the respondents in the study.

Table 1. Frequency and percentage distribution of the respondents

Respondents	Population (N)	%
Calbayog City National High School	100	60.61
San Policarpo National High School	45	27.27
San Joaquin National High School	20	12.12
Total	165	100.00

Since only three (3) schools are offering the STE program in the Schools Division of Calbayog, such as Calbayog City NHS, San Policarpo NHS, and San Joaquin NHS, all their Grade 8 STE students were included as respondents in this study. With this, complete or total enumeration and purposive sampling techniques were used in this study.

Research Instrument

This study utilized a researcher-made evaluation questionnaire. It is comprised of two (2) parts. The first part determined the

profile variables of the Grade 8 STE students as respondents of the study, such as sex, age, type of learning modality, first-quarter grade in Biotechnology, first-quarter grade in Statistics, and first-quarter grade in Research, and school. Then, the second part dealt with the evaluation of learning modules in terms of learning outcomes, content, resource materials, assessment, learning activities, clarity, cohesion, and feedback. This tool used a 5-point Likert scale: 5-Strongly Agree; 4-Agree; 3-Moderately Agree; 2-Slightly Disagree, and 1-Disagree. Moreover, the questionnaire underwent face validity and content validity. It was subjected to a validation process whereby the adviser and external validators validated the items' veracity and appropriacy. If there are corrections, the researcher shall consider them in order to improve the instrument. Then, the corrected instrument underwent pilot testing. It was administered to Grade 8 STE students of Catarman National High School, Northern Samar since they also use the same set of self-learning modules in add-on subjects. Thirty (30) samples served as respondents during the try-out validation. After which, the instrument's reliability was then measured through Cronbach's alpha before it was distributed among the actual respondents. Table 2 presents the reliability statistics of the research instrument as shown below.

Based on the generally accepted rule in Cronbach's alpha analysis (Cronbach, 1951) majority of the dimensions are interpreted as "very good," except for "resource materials," which is good. Thus, based on Cronbach's Alpha, the overall reliability coefficient is 0.971 indicating an "excellent" research instrument.

Data Gathering

Before conducting the study, the researcher had sought approval from the Office of Schools Division Superintendent, Schools Division of Calbayog City, to conduct the study in the identified junior high schools offering the STE program. In addition, the researchers requested permission from the Office of the Public Schools District Supervisors. As the instrument was approved, the researcher sent a letter to the principal informing the approved conduct of the study and his intention to gather information in their school. Further, he also wrote a letter to the respondents stating the purpose of his research investigation, their participation, and the confidentiality of their information. The target group was informed about the purpose of the research. Then, the research instrument was explained through a cover letter attached to the survey questionnaire.

Table 2. Reliability test analysis of the research instrument

Dimensions of the Self-Learning Modules	No. of Items	Cronbach's Alpha	Interpretation	Decision
A. Learning Outcomes	10	0.856	Very Good	Accepted
B. Content	10	0.858	Very Good	Accepted
C. Learning Activities	10	0.855	Very Good	Accepted
D. Assessment	10	0.817	Very Good	Accepted
E. Clarity	10	0.884	Very Good	Accepted
F. Cohesion	9	0.833	Very Good	Accepted
G. Resource Materials	5	0.763	Good	Accepted
H. Feedback	10	0.884	Very Good	Accepted
Over-all	74	0.971	Very Good	Accepted

Legend:

General Accepted Rule in Cronbach's Alpha Analysis (Cronbach, 1951):

Value	Interpretation	Decision
<0.6	Not Good	Rejected/Revised
0.6-0.7	Good	Accepted
0.8 >	Very Good	Accepted

Table 3. Test of normality

Dimensions	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
A. Learning Outcomes	0.143	165	0.000	0.952	165	0.000
B. Content	0.135	165	0.000	0.958	165	0.000
C. Learning Activities	0.112	165	0.000	0.944	165	0.000
D. Assessment	0.133	165	0.000	0.937	165	0.000
E. Clarity	0.169	165	0.000	0.907	165	0.000
F. Cohesion	0.135	165	0.000	0.943	165	0.000
H. Feedback	0.117	165	0.000	0.947	165	0.000
I. Resource Materials	0.180	165	0.000	0.896	165	0.000

a. Lilliefors Significance Correction

A Cronbach's alpha was utilized to measure the internal consistency (reliability) of the research questionnaire for the effectiveness of the self-learning module in add-ons subjects which consists of eight (8) subscales. The subscale "learning outcomes" consisted of 10 items ($\alpha = 0.856$), the "content" consisted of 10 items ($\alpha = 0.856$), the "learning activities" subscale consist of 10 items ($\alpha = 0.855$), the "assessment" consists of 10 items ($\alpha = 0.817$), the "clarity" subscale consists of 10 items ($\alpha = 0.884$), the "cohesion" subscale consists of 9 items ($\alpha = 0.833$), the "resource materials" subscale consists of 5 items ($\alpha = 0.763$), and the "feedback" consist of 10 items ($\alpha = 0.884$).

Then, the confidentiality and anonymity of the respondents were properly observed. Lastly, the questionnaire was retrieved, and then the data were gathered, tallied, analyzed, and presented using appropriate statistical tools. On the other hand, the test of normality of the data is presented in Table 3. A Kolmogorov-Smirnov and Shapiro-Wilk test was conducted to test the normality of the distribution of the study variable. As presented in Table 2, the distribution of the variables significantly departed from normality with a p-value less than 0.05, this means that all the data sets of the eight dimensions or sub-scales of the study are considered not normally distributed, and non-parametric statistics were used in treating the gathered data.

Data Analysis

The data and information in this study were coded and treated using IBM SPSS software version 28. Specifically, frequency and percentage distribution were used to describe the profile of the respondents in terms of sex, age, and type of learning modality, first-quarter grade in Biotechnology, first-quarter grade in Statistics, and first-quarter grade in Research. While mean and standard deviation were employed to describe the first-quarter grades of the students. The same statistical tool was used to determine the learning module evaluation gauged through the Likert scale in terms of learning outcomes, content, resource materials, assessment, learning activities, clarity, cohesion, and feedback. For the hypothesis testing, Mann Whitney-Uwas used to measure the significant difference in the perception of the respondents on the effectiveness of the self-learning modules when they were grouped according to their profile of two independent samples. Then, the Kruskal-Wallis test was used to determine the significant difference in the respondents' perception of the effectiveness of the self-learning modules when grouped according to schools as two or more independent samples. On the other hand, the pairwise comparison test was conducted as a post hoc analysis since there was a significant difference between the evaluation (learning activities) of the self-learning modules in add-on subjects and the performance of the students.

RESULTS AND DISCUSSION

Profile of the Grade 8 STE Students

Table 4 shows the profile of the Grade 8 STE students.

Age: As reflected in the table, most of the Grade 8 students are 13 years old (89 or 53.9%) compared to 14 years old (76 or 46.1%) students. Thus, considering the age of the respondents, all of them are at the right age of their grade level as Grade 8 students, as reflected in the average mean of 13.47 years old and with a standard deviation of 0.512. Therefore, the data implies that the Grade 8 STE students in three (3) schools are classified as teenagers and right age in their present grade level.

Sex: In terms of sex, female respondents outnumber male respondents, accounting for 78.6 percent (112) as against 32.1 percent (53) respectively, as shown in Table 4. This means that there are more female STE students than males, and it also implies that females dominate the Grade 8 STE classes.

Learning Modality: It can be gleaned from Table 4 that most of the Grade 8 STE students are into an online learning modality (100 or 60.0%) as compared to modular distance learning (65 or 39.4%). Looking into the data, more than half of the Grade 8 STE have online learning modality comes from Calbayog City National High School, which they implemented a purely online class as compared to two (2) other schools offering the STE program, namely, San Policarpo National High School and San Joaquin National High School. Therefore, it can be concluded that all the STE students of Calbayog City NHS have an internet connection at home. In contrast, the other two (2) schools have no or weak internet connectivity considering the place of origin of their students.

Table 4. Frequency and percentage distribution on the profile of the Grade 8 STE students in terms of age, sex, type of learning modality, and school (n=165)

Profile	f	%	
Age (Mean = 13.47 yo; sd=0.512)	13	89	53.9
	14	76	46.1
Sex			
	Male	53	32.1
	Female	112	67.9
Type of Learning Modality			
	Modular	65	39.4
	Online	100	60.6
School			
	Calbayog City NHS	100	60.61
	San Policarpo NHS	45	27.27
	San Joaquin NHS	20	12.12

Legend: yo = years old

School: Most of the Grade 8 STE student-respondents are taken from Calbayog City National High School (100 or 60.61%), followed by San Policarpo National High School (45 or 27.27%), and San Joaquin National High School (20 or 12.12%) has the lowest number of students. It means that Calbayog City National High School has more STE students than the other two (2) schools. Therefore, it can be concluded that Calbayog City NHS is offering two (2) sections of the STE classes, while the other schools have only one (1) section.

Table 5. Frequency and percentage distribution on the profile of the Grade 8 STE students in terms of first-quarter grades in Add-on subjects (n=165)

Performance Level	Biotech	Statistics	Research	Overall
Outstanding (90-100)	100 (60.6%)	94 (56.97%)	111 (67.27%)	98 (59.40%)
Very Satisfactory (85-89)	57 (34.45%)	48 (29.10)	40 (24.24%)	42 (25.45%)
Satisfactory (80-84)	8 (4.85%)	23 (13.90%)	14 (8.49%)	25 (15.15%)
Mean	90.30	89.79	89.91	90.00
Standard deviation	3.60	4.61	3.68	3.43

As presented in the table above, a great majority of the respondents' academic performance is "Outstanding", with scores ranging from 90 to 100 across the three (3) subjects: Biotechnology (100 or 60.6%), Statistics (94 or 56.97%), and Research (111 or 67.27%). In summary, the general average of the Grade 8 STE students in Biotechnology is 90.30 (sd=3.60), Statistics is 89.79 (sd=.61), and Research 89.9 (sd=3.68). The data implies that the academic performance of the Grade STE students in Biotechnology is "Outstanding" (M=90.00, sd=3.43), while they have shown "Very Satisfactory" in the add-on subjects of Statistics (M=89.79; sd=4.61) and Research (M=89, 91;sd=3.43). The data conclude that the Grade 8 STE students are performing well in these add-on subjects in both online and modular learning modalities.

Effectiveness of Self-Learning Modules

Table 6 presents the mean and standard deviation on the effectiveness of the self-learning modules of the add-on subjects of the Grade 8 STE program. As presented in Table 6, the means of variables of the study is above 4.21. This result reveals that the respondents 'strongly agreed' with all the dimensions of the self-learning modules.

Also, as indicated in the table, 'resource material' (M=4.48, SD=0.45) was evaluated as the highest mean on its effectiveness followed by 'Clarity' (M=4.46, SD=0.44), 'Cohesion' (M=4.46, SD=0.40), 'Assessment' (M=4.45, SD=0.40), 'Feedback' (M=4.36, SD=0.47), 'Learning Activities' (M=4.34, SD=0.45), and Learning Outcomes (M=4.34, SD=0.44). the least among the indicators is the 'content' (M=4.30, SD=0.46). As revealed in the table above, all of the sub-scales on the effectiveness of self-learning modules were evaluated by the student-respondents as "very effective." This finding concludes that the self-learning modules, in general, are effective as instructional learning material for Grade 8 STE students during this time of the pandemic.

(U=3030, p=0.248), Clarity (U=2843, p=0.076), Cohesion (U=3010.50, p=0.222), Feedback (U=2977.50, p=0.184), and Resource Materials (U=2783.50, p=0.050), all the computed p-values were greater than 0.05 level of significance. Thus, the researcher rejects the null hypothesis and concludes that there is no significant difference between ages (13 and 14 years old) in the evaluation (effectiveness) of SLMs in terms of content, learning activities, clarity, cohesion, feedback, and resource materials. On the other hand, the p-value of assessment (U=2569.50, p=0.008) and learning outcomes (U=2620, p=0.012) are less than the significance level of 0.05. Thus, the researcher concludes that there is a significant difference between ages (13 and 14 years old) in the effectiveness of SLMs in terms of 'learning outcomes' and 'assessment'.

Table 6. Mean and standard deviation on the effectiveness of the Self-Learning Modules

Dimensions	N	M	SD	Description	Interpretation
A. Learning Outcomes	165	4.34	0.44	Strongly Agree	Very Effective
B. Content	165	4.30	0.46	Strongly Agree	Very Effective
C. Learning Activities	165	4.34	0.45	Strongly Agree	Very Effective
D. Assessment	165	4.45	0.40	Strongly Agree	Very Effective
E. Clarity	165	4.46	0.44	Strongly Agree	Very Effective
F. Cohesion	165	4.46	0.40	Strongly Agree	Very Effective
J. Resource Materials	165	4.48	0.45	Strongly Agree	Very Effective
H. Feedback	165	4.36	0.47	Strongly Agree	Very Effective
Overall	165	4.40	0.37	Strongly Agree	Very Effective

Legend:	Scale	Description	Interpretation
4.21 – 5.00	Strongly Agree	Very Effective	<i>M=mean, SD=standard deviation</i>
3.41 – 4.20	Agree	Effective	
2.61 – 3.40	Neutral	Moderately Effective	
1.81 – 2.60	Disagree	Slightly Effective	
1.00 – 1.80	Strongly Disagree	Not Effective	

Table 7. Test of difference in the effectiveness of the SLMs in Add-on subjects as to age

SLM Dimensions	Age	N	Mean Rank	Sum of Ranks	Mann-Whitney U	p-value
Learning Outcomes	13 years old	89	74.44	6625.00	2620.00	0.012*
	14 years old	76	93.03	7070.00		
Content	13 years old	89	76.72	6828.00	2823.00	0.067
	14 years old	76	90.36	6867.00		
Learning Activities	13 years old	89	79.04	7035.00	3030.00	0.248
	14 years old	76	87.63	6660.00		
Assessment	13 years old	89	73.87	6574.50	2569.50	0.008*
	14 years old	76	93.69	7120.50		
Clarity	13 years old	89	76.94	6848.00	2843.00	0.076
	14 years old	76	90.09	6847.00		
Cohesion	13 years old	89	78.83	7015.50	3010.50	0.222
	14 years old	76	87.89	6679.50		
Feedback	13 years old	89	78.46	6982.50	2977.50	0.184
	14 years old	76	88.32	6712.50		
Resource Materials	13 years old	89	78.15	6955.00	2950.00	0.152
	14 years old	76	88.68	6740.00		
Overall	13 years old	89	76.28	6788.50	2783.50	0.050
	14 years old	76	90.88	6906.50		

*N=165; *significance at p<.05*

Test of difference between the perception of the respondents in the effectiveness of the self-learning modules in add-on subjects and their profiles

Tables 7 to 12 show the test of differences in the perception of the respondents on the effectiveness of the self-learning modules in add-on subjects when they are grouped according to their profile using the Mann-Whitney U test for two independent samples. At the same time, Kruskal-Wallis is a nonparametric test used to determine the significant difference between 2 or more independent samples. Both tests are used for non-normally distributed data, as shown in Table 3 in the previous section. Table 7 shows the test for differences in the effectiveness of the self-learning modules in add-on subjects between ages. Content (U=2620, p=0.067), Learning Activities

'As indicated in table 14, the mean rank of the '14 years old' student (M=93.03) is greater than the mean rank of '13 years old' (M=74.44) for 'learning outcomes'. Also, the mean rank of the '14 years old' student (M=93.69) is greater than the mean rank of '13 years old' (M=73.87) for assessment. This result indicates that fourteen-year-old students perceived that SLMs are more effective in learning outcomes and assessment.

Table 8 shows the test for differences in the effectiveness of the self-learning modules in add-on subjects between sexes. Learning outcomes (U=2563, p=0.156), Content (U=2844, p=0.664), Learning Activities (U=2412.5, p=0.52), Clarity (U=2746, p=0.436), and Feedback (U=2514, p=0.112) computed p-values were greater than 0.05 level of significance. Thus, the researchers reject the null hypothesis and conclude

that there is no significant difference between ages (13 and 14 years old) in the effectiveness of SLMs in terms of Learning Outcomes, Content, Learning Activities, Clarity, and Feedback. On the other hand, the p-value of Cohesion ($U=2405.00$, $p=0.048$) and Resource Materials ($U=2407$, $p=0.047$) is less than the significance level of 0.05. Thus, the researchers conclude that there is a significant difference between males and females in the effectiveness of SLMs in terms of 'cohesion' and resource materials. As indicated in table 15, the mean rank of the 'male' student ($M=93.62$) is greater than the mean rank of the 'female' student ($M=77.97$) for 'cohesion.' Also, the mean rank of the 'male' student ($M=93.58$) is greater than the mean rank of 'female' students ($M=77.99$) for resource material. This result indicates that male students perceived that SLM is more effectively done in terms of cohesion and resource materials.

SLMs in terms of learning outcomes, content, learning activities, assessment, cohesion, clarity, and feedback. The value indicates that modular and online modalities for SLMs in add-on subjects are both effectively done. Lastly, Table 10 shows the significant difference in the effectiveness of the self-learning modules in add-on subjects as to the students' performance. Learning Outcomes ($H=4.15$, $p=0.126$), Content ($H=4.90$, $p=0.086$), Assessment ($H=2.44$, $p=0.296$), Clarity ($H=0.50$, $p=0.778$), Cohesion ($H=0.90$, $p=0.638$), Feedback ($H=0.90$, $p=0.638$), and Resource Materials ($H=2.66$, $p=0.264$) the computed p-s were greater than 0.05 level of significance. Thus, the researchers fail to reject the null hypothesis and conclude that there is no significant difference between the students' academic performance on the evaluation of SLM in terms of learning outcomes, content, assessment, cohesion, clarity, feedback, and resource materials.

Table 8. Test of difference in the effectiveness of the SLMs in Add-on subjects as to sex

SLM Dimensions	Sex	N	Mean Rank	Sum of Ranks	Mann-Whitney U	p-value
Learning Outcomes	Male	53	90.64	4804.00	2563.00	0.156
	Female	112	79.38	8891.00		
Content	Male	53	85.34	4523.00	2844.00	0.664
	Female	112	81.89	9172.00		
Learning Activities	Male	53	93.48	4954.50	2412.50	0.052
	Female	112	78.04	8740.50		
Assessment	Male	53	96.56	5117.50	2249.50	0.012*
	Female	112	76.58	8577.50		
Clarity	Male	53	87.19	4621.00	2746.00	0.436
	Female	112	81.02	9074.00		
Cohesion	Male	53	93.62	4962.00	2405.00	0.048*
	Female	112	77.97	8733.00		
Feedback	Male	53	91.57	4853.00	2514.00	0.112
	Female	112	78.95	8842.00		
Resource Materials	Male	53	93.58	4960.00	2407.00	0.047*
	Female	112	77.99	8735.00		
Overall	Male	53	92.41	4897.50	2469.50	0.082
	Female	112	78.55	8797.50		

N=165; *Significance at $p<.05$

Table 9. Test of difference on the effectiveness of the SLMs in Add-on subjects as to learning modalities

SLM Learning Dimensions	Modalities	N	Mean Rank	Sum of Ranks	Mann-Whitney U	p-value
Learning Outcomes	Modular	65	81.14	5274.00	3129.00	0.69
	Online	100	84.21	8421.00		
Content	Modular	65	88.38	5745.00	2900.00	0.24
	Online	100	79.50	7950.00		
Learning Activities	Modular	65	86.54	5625.00	3020.00	0.44
	Online	100	80.70	8070.00		
Assessment	Modular	65	84.40	5486.00	3159.00	0.76
	Online	100	82.09	8209.00		
Clarity	Modular	65	85.69	5570.00	3075.00	0.56
	Online	100	81.25	8125.00		
Cohesion	Modular	65	82.49	5362.00	3217.00	0.91
	Online	100	83.33	8333.00		
Feedback	Modular	65	85.39	5550.50	3094.50	0.60
	Online	100	81.45	8144.50		
Resource Materials	Modular	65	83.33	5416.50	3228.50	0.94
	Online	100	82.79	8278.50		
Overall	Modular	65	85.33	5546.50	3098.50	0.61
	Online	100	81.49	8148.50		

N=165; *Significance at $p<.05$

Table 9 shows the test for the difference in the effectiveness of the self-learning modules in add-on subjects regarding the type of modalities used. Learning outcomes ($U=3129$, $p=0.69$), Content ($U=2900$, $p=0.024$), Learning Activities ($U=3020$, $p=0.44$), Assessment ($U=3159$, $p=0.76$), Clarity ($U=3075$, $p=0.56$), Feedback ($U=3217$, $p=0.9$), and Resource Materials ($U=3228$, $p=0.94$) the computed p-s were greater than 0.05 level of significance. Thus, the researchers reject the null hypothesis and conclude that there is no significant difference in age (between 13 and 14 years old) in the effectiveness of

On the other hand, there is a significant difference in terms of learning activities ($H=4.90$, $p=0.026$) with a p= less than 0.05 level of significance. A pairwise comparison among the variables is presented in Table 11, indicating a significant difference between students with a performance of 'very satisfactory' and 'satisfactory' ($U=67.06$, $p=0.02$) with a p-value less than the significance level of 0.05. This finding disclosed that students with a 'very satisfactory' performance perceived that 'learning activities are effective in the SLMs for add-on subjects.

Table 10. Test of difference on the effectiveness of the SLMs in Add-on subjects as to performance

SLM Dimensions	Performance	N	Mean Rank	Kruskal-Wallis H	p=
Learning Outcomes	Satisfactory (80-84)	14	85.18	4.15	0.126
	Very satisfactory (85-89)	42	65.71		
	Outstanding (90-100)	98	81.45		
Content	Satisfactory (80-84)	14	102.14	4.90	0.086
	Very satisfactory (85-89)	42	72.70		
	Outstanding (90-100)	98	76.04		
Learning Activities	Satisfactory (80-84)	14	105.07	7.30	0.026*
	Very satisfactory (85-89)	42	68.01		
	Outstanding (90-100)	98	77.63		
Assessment	Satisfactory (80-84)	14	93.07	2.44	0.296
	Very satisfactory (85-89)	42	80.15		
	Outstanding (90-100)	98	74.14		
Clarity	Satisfactory (80-84)	14	84.68	0.50	0.778
	Very satisfactory (85-89)	42	74.98		
	Outstanding (90-100)	98	77.56		
Cohesion	Satisfactory (80-84)	14	88.21	0.90	0.638
	Very satisfactory (85-89)	42	76.62		
	Outstanding (90-100)	98	76.35		
Feedback	Satisfactory (80-84)	14	79.11	0.21	0.899
	Very satisfactory (85-89)	42	79.86		
	Outstanding (90-100)	98	76.26		
Resource Materials	Satisfactory (80-84)	14	95.29	2.66	0.264
	Very satisfactory (85-89)	42	77.87		
	Outstanding (90-100)	98	74.80		
Overall	Satisfactory (80-84)	14	94.75	2.49	0.288
	Very satisfactory (85-89)	42	73.29		
	Outstanding (90-100)	98	76.84		

N=165; *Significance at $p < .05$ **Table 11. Post-Hoc Analysis on the test of difference in the effectiveness of the SLMs in Add-on subjects as to the performance of the students in terms of learning activities**

Sample 1 vs. Sample 2	Test Statistic	Std. Error	p-value
Very Satisfactory (85-89)	-9.616	8.199	0.723
Outstanding (90-100)			
Very Satisfactory (85-89)	67.06*	2.701	0.021
Satisfactory (80-84)			
Outstanding (90-100)	27.44	2.16	0.051
Satisfactory (80-84)			

*Significance at $p < .05$ **Table 12. Test of difference in the effectiveness of the SLMs in Add-on subjects in terms of schools**

SLM Dimensions	Schools	N	Mean Rank	Kruskal-Wallis H	p-value
Learning Outcomes	Calbayog City NHS	100	84.56	1.39	0.499
	San Policarpo NHS	45	84.76		
	San Joaquin NHS	20	71.23		
Content	Calbayog City NHS	100	79.77	2.89	0.236
	San Policarpo NHS	45	92.97		
	San Joaquin NHS	20	76.08		
Learning Activities	Calbayog City NHS	100	80.69	3.43	0.180
	San Policarpo NHS	45	92.99		
	San Joaquin NHS	20	71.45		
Assessment	Calbayog City NHS	100	82.08	4.87	0.088
	San Policarpo NHS	45	92.82		
	San Joaquin NHS	20	64.98		
Clarity	Calbayog City NHS	100	81.58	0.23	0.893
	San Policarpo NHS	45	85.39		
	San Joaquin NHS	20	84.55		
Cohesion	Calbayog City NHS	100	83.75	2.04	0.360
	San Policarpo NHS	45	87.30		
	San Joaquin NHS	20	69.38		
Feedback	Calbayog City NHS	100	82.24	0.07	0.967
	San Policarpo NHS	45	83.88		
	San Joaquin NHS	20	84.73		
Resource Materials	Calbayog City NHS	100	83.30	1.45	0.485
	San Policarpo NHS	45	87.13		
	San Joaquin NHS	20	72.00		
Overall	Calbayog City NHS	100	81.85	1.47	0.480
	San Policarpo NHS	45	89.18		
	San Joaquin NHS	20	74.45		

N=16; *Significance at $p < .05$

Table 13. Test of correlations between the perception of the respondents on the effectiveness of the SLMs in Add-on subjects and their profile

SLM Dimensions			Age	Sex	Modality	School	Performance
Kendall's tau_b	Learning Outcomes	Correlation Coefficient	0.165*	-0.094	0.027	-0.048	0.076
		Sig. (2-tailed)	0.012	0.156	0.686	0.453	0.250
	N	165	165	165	165	165	
Content	Content	Correlation Coefficient	0.121	-0.029	-0.077	0.049	-0.062
		Sig. (2-tailed)	0.067	0.664	0.242	0.440	0.348
	N	165	165	165	165	165	
Learning Activities	Learning Activities	Correlation Coefficient	0.076	-0.128	-0.051	0.022	-0.031
		Sig. (2-tailed)	0.248	0.052	0.442	0.725	0.645
	N	165	165	165	165	165	
Assessment	Assessment	Correlation Coefficient	0.177**	-0.167*	-0.020	-0.014	-0.095
		Sig. (2-tailed)	0.008	0.012	0.760	0.826	0.156
	N	165	165	165	165	165	
Clarity	Clarity	Correlation Coefficient	0.118	-0.052	-0.039	0.029	-0.008
		Sig. (2-tailed)	0.076	0.436	0.557	0.652	0.909
	N	165	165	165	165	165	
Cohesion	Cohesion	Correlation Coefficient	0.081	-0.131*	0.007	-0.036	-0.039
		Sig. (2-tailed)	0.222	0.048	0.912	0.573	0.561
	N	165	165	165	165	165	
Feedback	Feedback	Correlation Coefficient	0.088	-0.105	-0.034	0.018	-0.028
		Sig. (2-tailed)	0.184	0.112	0.603	0.780	0.672
	N	165	165	165	165	165	
Resource Materials	Resource Materials	Correlation Coefficient	0.098	-0.136*	-0.005	-0.024	-0.085
		Sig. (2-tailed)	0.152	0.047	0.942	0.717	0.214
	N	165	165	165	165	165	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Test of difference in the perception of the respondents on the effectiveness of the self-learning modules in add-on subjects when grouped according to school

Table 12 shows the test of difference in the perception of the respondents on their evaluation of the effectiveness of the SLMs in add-on subjects when they are grouped according to school. Results showed that Learning Outcomes ($H=1.39$, $p=0.499$), Content ($H=2.89$, $p=0.236$), Learning Activities ($H=3.43$, $p=0.180$), Assessment ($H=4.87$, $p=0.088$), Clarity ($H=0.23$, $p=0.893$), Cohesion ($H=2.04$, $p=0.360$), Feedback ($H=0.07$, $p=0.967$), and Resource Materials ($H=0.45$, $p=0.485$) computed p 's were greater than 0.05 level of significance. Thus, the researchers fail to reject the null hypothesis and conclude that there is no significant difference between the students' academic performance on the evaluation of SLM in terms of learning outcomes, content, learning activities, assessment, cohesion, clarity, feedback, and resource materials.

Test of relationship between the perception of the respondents on the effectiveness of the self-learning modules in add-on subjects and their profile

The significant relationship between the respondents' perception of the effectiveness of the self-learning modules in add-on subjects and demographic profile is summarized in Table 13.

Learning Outcomes: With a p -value of greater than 0.05 level of significance, there is no significant relationship on the learning outcomes with sex ($r_t=-0.094$, $p=0.156$), modality ($r_t=-0.027$, $p=0.686$), school ($r_t=-0.048$, $p=0.453$), and performance ($r_t=0.076$, $p=0.250$). While there is a significant positive relationship on the learning outcome with age ($r_t=0.165$, $p=0.012$) with a p less than 0.05 level of significance. This means as the age of the students' increases, the higher the perceived evaluation of the self-learning modules in add-on subjects.

Content: With a p -value of greater than 0.05 level of significance, there is no significant relationship on the content with age ($r_t=0.121$, $p=0.067$), sex ($r_t=-0.029$, $p=0.664$), modality ($r_t=-0.077$, $p=0.242$), school ($r_t=0.049$, $p=0.440$), and performance ($r_t=-0.062$, $p=0.154$).

Learning Activities: With a p -value of greater than 0.05 level of significance, there is no significant relationship on the content with age ($r_t=0.076$, $p=0.248$), sex ($r_t=-0.128$, $p=0.052$), modality ($r_t=-0.051$, $p=0.442$), school ($r_t=0.022$, $p=0.725$), and performance ($r_t=-0.031$, $p=0.645$).

Content: With a p -value of greater than 0.05 level of significance, there is no significant relationship between the content with modality ($r_t=-0.020$, $p=0.760$), school ($r_t=0.014$, $p=0.826$), and performance ($r_t=-0.095$, $p=0.156$). In contrast, there is a significant positive relationship between the content with age ($r_t=0.177$, $p=0.008$) with a p less than 0.05 level of significance. This finding suggests that as the age of the students' increases, the higher the perceived evaluation of the self-learning modules in add-on subjects in terms of content. Also, there is a significant negative relationship between the content with sex ($r_t=-0.167$, $p=0.012$) with a p less than 0.05 level of significance. This result means male students had a higher perceived evaluation of the self-learning modules in add-on subjects in terms of content.

Clarity: With a p -value of greater than 0.05 level of significance, there is no significant relationship on the clarity with age ($r_t=0.118$, $p=0.076$), sex ($r_t=-0.052$, $p=0.436$), modality ($r_t=-0.039$, $p=0.557$), school ($r_t=0.029$, $p=0.652$), and performance ($r_t=-0.008$, $p=0.154$).

Cohesion: With a p -value of greater than 0.05 level of significance, there is no significant relationship on the cohesion with age ($r_t=0.081$, $p=0.076$), modality ($r_t=0.007$, $p=0.912$), school ($r_t=0.036$, $p=0.573$), and performance ($r_t=-0.039$, $p=0.561$). While there is a significant negative relationship the cohesion with sex ($r_t=-0.131$, $p=0.048$) with a

$p < 0.05$ level of significance. This data divulged that male student had a higher perceived evaluation of the self-learning modules in add-on subjects in terms of cohesion.

Feedback: With a p -value of greater than 0.05 level of significance, there is no significant relationship on the feedback with age ($r_t=0.088$, $p=0.187$), sex ($r_t=-0.105$, $p=0.112$), modality ($r_t=-0.034$, $p=0.603$), school ($r_t=0.018$, $p=0.780$), and performance ($r_t=-0.028$, $p=0.214$).

Resource Materials: With a p -value of greater than 0.05 level of significance, there is no significant relationship on the resource materials with age ($r_t=0.098$, $p=0.152$), modality ($r_t=-0.005$, $p=0.942$), school ($r_t=-0.024$, $p=0.717$), and performance ($r_t=-0.085$, $p=0.214$). While there is a significant negative relationship between the resource materials with sex ($r_t=-0.136$, $p=0.047$) with a $p < 0.05$ level of significance. This result shows that male students had higher perceived effectiveness of the self-learning modules in add-on subjects regarding resource materials.

Conclusion

The researchers concluded that Grade 8 STE students of the three (3) schools offering the special science program in the Schools Division of Calbayog were dominated by females and at the right age of their grade level. They showed an outstanding performance in their add-on subjects regardless of learning modality (online and modular distance learning) in their first-quarter grades. The self-learning modules in add-on subjects (Biotechnology, Research, and Statistics) were evaluated as effective learning material. The study also concluded that age had shown significant differences in the SLM's learning outcomes and assessment dimensions. While gender had shown significant differences in cohesion and resource materials of the SLM; then, performance in the first quarter showed significant differences in learning activities of the SLM. On the other hand, the learning modalities of the students had shown no significant differences in any dimensions of the SLM as evaluated by the respondents. Further, the school is not a determining factor as to the effectiveness of SLM in add-on subjects of the Grade 8 students. Only age and gender among the profile variables of the respondents have shown a significant relationship with learning outcomes, assessment, cohesion, and resource materials as perceived by the respondents on their evaluation of the SLM in add-on subjects. Lastly, the researchers recommend other assessment procedures or techniques in evaluating the effectiveness of the developed self-learning modules, like achievement tests covering the most essential learning competencies covered in the SLM. Moreover, another research study will be conducted to compare the performance of the learners with the control group (without using the SLM) and the experimental group (intervened with SLM) to measure the effectiveness of the developed SLM.

Acknowledgment: The researchers would like to thank the school principals and STE teachers who allowed the researchers to conduct the study, especially the students who actively participated.

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