

*Original Article*

# The Effectiveness of the Self-Learning Module in Science 6 towards the Development of Interactive Learning Resources

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**Abstract:** The study aimed to evaluate the effectiveness of the self-learning module in terms of most essential learning competencies, instructional design and organization, instructional quality of text and visuals, assessment, readability, usability, referencing and source citation, and monitoring and review through a survey of two groups of respondents: science teachers, and the module validators. It sought to determine whether there is a difference between the evaluations of the science teachers and module validators, to determine the difference on the status of the student's performance in Science 6 before and after use of the SLMs, to discuss the processes undertaken in the development of the interactive learning resources, to determine the difference in the evaluations of the science teachers, module validators, and the grade 6 students of the developed interactive learning resources with regard to the following features: instructional design and organization, instructional quality of text and visuals, assessment, readability, usability, referencing and source citation, and privacy, data protection, and rights. This study is anchored on the theories: the Law of Effect Principle, Self-determination Theory, Constructivism Theory, Humanistic Learning Theory, and Connectivism Learning Theory. The study employed 30 science teachers, 22 module validators, and 278 grade 6 students. It underwent pilot testing and used a Cronbach Alpha for the reliability of the instruments and employed the descriptive method of research with the following statistical treatment through the use of SPSS Version 2.0: mean and standard deviation, t-test, and paired t-test used to compare the results derived from the student performance. Findings of the study revealed that evaluation of science teachers and module validators on the self-learning module in Science did not have significant difference and signify effectiveness where students' performance has a dramatic change from average mastery to moving towards mastery after the use of the SLM. In the development of the interactive learning resources, it is anchored in the ADDIE Model where the respondents strongly agreed which suggests a high level of consensus and agreement among these different respondents regarding the quality, effectiveness, and suitability of the material. The SMART MODU app is recommended to be used in the lesson delivery to evaluate its potential effectiveness of the students' performance towards the subject and a training conducted on the navigation of the interactive learning resources is encouraged.

**Keywords:** evaluation, ADDIE Model, interactive learning resources, role science in education

## 1. INTRODUCTION

As we advance into the era of Education 5.0, the integration of science and technology becomes even more critical in reshaping the educational landscape. Science and technology are at the heart of Education 5.0, driving a transformative shift towards a more personalized, immersive, and equitable educational experience. By leveraging advanced technologies, educators can create dynamic learning environments that cater to individual needs, foster collaboration, and promote lifelong learning.

Education 5.0 empowers all students to thrive in an increasingly complex and interconnected world [1]. As educators and policymakers continue to integrate science and technology into educational frameworks, it is essential to address the associated challenges and ensure that these tools are used ethically and effectively to enhance the learning experience for all students. Science is a fundamental subject in the educational curriculum, and its importance in molding students cannot be understated [2]. The new method of instructing and learning the subjects provided by the schools is being embraced by all [3]. The most widely used teaching and learning method for offering distance education is modular teaching in western nations like the USA and Australia. The modular teaching approach is used in almost all subject areas, including natural science and other associated fields. The modules should take into account the specific variances among students and use the best teaching strategies to support each one's personal growth and development [4]. The self – learning modules (SLMs) should have the following qualities: they should be independent, self – contained, educational, well – defined, and use a variety of media. They should also enable students to actively participate in the learning process. Additionally, putting students at the center of the teaching – learning process is at the core of modularization. It demands a learning environment in which students actively participate in the process of creating new information and a change in the instructor's function from knowledge transmitter to facilitator of students' learning. Moreover, modularization necessitates ongoing monitoring and evaluation of students' progress throughout the module/course. Teachers must continue to communicate with their students, give assignments, and most importantly, give timely feedback. The self – learning modules is one of the three types of methodologies used by the Department of Education to provide distant learning to Filipino students [5]. In the City Division of Makati, the SLMs are used even in the face-to-face learning. There are readily printed self – learning modules and teachers, parents and students can download the SLMs from the provided link or website. The selected teachers are given the responsibility of writing learning modules, which serve as of the main sources of information for the delivery of teaching [6]. These modules are one of the most comprehensively organized instructional resources. They assist students in gathering information more methodically and practically. Individually or in groups, students will comprehend a particular topic by using the teaching materials [7]. To guarantee that the elements of the learning modules are satisfied or rooted in the Department of Education's Most Essential Learning Competencies, a learning resource, especially a module, should be prepared, organized, and reviewed well by a teacher or an expert. The most extensively used learning tools are modules, so it is crucial to plan them carefully. A module is a useful resource that will enable the teacher and students to collaborate effectively and achieve a common objective, understanding a particular lesson and successfully applying it to everyone's lives [8]. The students will have a better chance of understanding each lesson with the aid of the prepared science module. The self – learning modules can serve as pre-class assignments where the pupils can familiarize themselves with the basic concepts before coming to school, allowing face- to-face time to be more interactive and focused on discussions, problem-solving, application of knowledge rather than simply delivering the content. Incorporating the SLMs allows the integration of technology into the learning process [9]. This not only prepares pupils for digital age but also caters to varying learning preferences, leveraging multimedia elements for enhanced understanding [10]. Today, in science education, technology is defined as any tool used to improve the quality of learning. In the context of science education, technology is described as any device that enhances the standard of instruction [11]. As stated by students are defined today as digital natives. They have never lived in a world without social media, smartphones, or tablets. They want to create more than simply PowerPoint presentations, they need technology, and they require dynamic interactive material. These are the part of first generation to grow immersed and fluent in the world of digital technologies. Technology is changing the way we learn they can adopt to new technology with ease. These digital natives depend on digital information for communication, education and entertainment [12]. The use of interactive learning material will

help teachers make classroom teaching more attractive and will help students to get more interest in the subject for effective learning. Social media can help us engage digital natives and revolutionize teaching. We live in a technologically advanced society [13]. A grounding in science helps students understand and navigate the various technologies they encounter daily, preparing them for the modern world. As students learn about scientific advancements, they are also prompted to consider the ethical implications of these developments. Incorporating science in education equips students with tools and skills that are essential not only in academic and professional pursuits but also in daily life. It fosters a well-rounded worldview, enabling students to become informed and engaged citizens of the world [14]. Today's society places an ever-increasing emphasis on understanding science and technology, and schools are faced with the problem of offering all pupils engaging science learning opportunities. The effectiveness of teachers' instruction therefore serves as a crucial fulcrum for enhancing scientific education because they are at the forefront of addressing this dilemma. At the international level like Australia or the United States, approaches to science teaching and learning are less established. Western countries, despite their advanced economies and well-developed education systems, still face challenges when it comes to students studying science. Many students perceive science as difficult, boring, or irrelevant. This can be due to the way the subject is taught, which may lack hands-on activities, real-world applications, the availability of appropriate textbooks, or engaging multimedia resources. (National Center for Education Statistics) [15], in the most recent assessment, the U.S. fell behind, ranking 22nd with an average score of 495.0 points. Although the United States harbors many of the world's top universities [16]. This is because due to COVID -19 pandemic, and there was less likely to report a shortage of educational material. 15-year-old students in USA scores on the test did not significantly change. About 60% of science instructors in the US claim to employ "reform-oriented science teaching practices," such as having their students engage in hands-on or laboratory activities, providing evidence for their claims, and representing and/or analyzing data using tables, charts, or graphs [17]. On the other hand, teachers' self-reports of the classroom activities in their most recent lesson confirmed that teachers typically engage in more traditional instructional practices, such as "teacher explaining a science idea to the whole class," "whole-class discussion," and "students completing textbook/worksheet problems." (National Academies of Sciences, Engineering, and [18]. The instruction of lessons at an information level and students in a passive position (only listening and writing), teachers in an active position (writing on the board and teaching classically), are one of the cited challenges for science education. Science's heavy reliance on memorization is another factor in its difficulty as a subject to master. Students must be able to retain a lot of data to comprehend scientific concepts. For those who struggle to recall information for extended periods, this may be problematic. Additionally, bad note-taking techniques make this issue worse. For instance, students who struggle to take brief and legible notes during lectures would find it challenging to later examine and recall the scientific subject. As a result, they frequently have trouble memorizing knowledge for tests and other assessment tasks [19]. In reading, arithmetic, and science, 15-year-old children in the Philippines performed worse than people in the majority of the economies and nations that took part in PISA. The Department of Education recognizes the urgency of addressing issues and gaps in attaining the quality of basic education in the Philippines by launching the agendas "Sulong Edukalidad" in which both highlight making the curriculum relevant and take steps to accelerate the delivery of basic education and taking care of learners by promoting learner well – being, positive learning environment by upskilling and reskilling of teachers to teach better. To provide additional academic support to underachievers, schools must have sufficient people and material resources. Interventions should also take into account non-academic elements that support academic resilience, such as enhancing instructors' capacity to develop healthy classroom climates and encouraging learners to adopt a growth mindset. Also, the Philippines received the lowest results among the 58 participating countries in the Trends in International Mathematics and Science Study (TIMSS), receiving scores in mathematics and

science of 297 and 249. About 3 percent of Filipino students were in the low benchmark, which means "students show limited understanding of scientific concepts and limited knowledge of foundational science facts." This year, the Philippines remain among the world's weakest in math, reading, and science. The country's average score is decreased by one point from 356 to 355 than in 2018 which resulted the country ranked as third – lowest in science [20]. Based on the results, most 15 – year old Filipino students do not have the minimum knowledge of their age group in all three subjects. Recent initiatives in the Philippines have been made to further research basic and teacher education levels of education. According to research, the caliber of scientific teachers has a significant impact on the quality of science instruction in schools. The quality of the instruction and learning experiences that students' science teachers deliver have a direct impact on the student's interest in science (DOST, 2011). The predominance of teacher-centered classrooms and teaching practices is one of the challenges in teaching science. Many lack the subject and pedagogical abilities necessary to teach science. Science instructors lecture to pupils instead of presenting them with interesting and the latter can produce original thoughts thanks to difficult actions. Oftentimes, Science instruction still mostly uses textbooks, and frequently, concepts are not relevant to daily life or the community. Generally, the lack of good and engaging textbooks and lack of science equipment have hindered the conduct of scientific investigations and hands-on activities among Filipino pupils. Recently, the students in Pitogo Elementary School have been using self – learning modules as one of the main learning resources which were written and validated by the selected teachers, and supervisors in the City Division of Makati. A module is a useful resource that will enable the teacher and students to collaborate effectively and achieve a common objective—understanding a particular lesson and successfully applying it to everyone's lives. The pupils will have a better chance of understanding each lesson with the aid of the prepared science module. However, as a science teacher for 6 years observed the percentage level of mastery of the students did not attain the 75% level of mastery. This has been strong evidence in their raw scores during formative, summative, and quarterly assessments [21].

## 2. MATERIALS AND METHODS

The research design employed in conducting the study. The research locale, the validation of the instruments, the participants of the study, the data gathering instruments and procedures, the statistical tools, the research methodological framework, the discussion on the development process of ILR, and the ethical consideration, and how the research study was analyzed, interested, and scheduled. This study employed descriptive and applied developmental methods of research which focused on the evaluation of the respondents on the effectiveness of SLM, the researcher's developed ILR, and determining the significant difference on the pretest and posttest results of the students using SLM. The evaluation of the science teachers, module validators (master teachers) and the grade 6 students involved some sort of comparison or contact to find relationships. The modified criteria in evaluating the effectiveness of the SLM by the Department of Education in DepEd Order No.001 s. 2021 and in evaluating the features of ILR of MERLOT (Multimedia Educational Resource for Learning and Online Teaching) were used by the researcher. For the School this study carried out at (5) elementary schools namely Cembo Elem. School, Nemesis I. Yabut Elem. School, Pitogo Elem. School, San Jose Elem. School, and South Cembo Elem. School. Cembo Elementary School (CES) caters two single shifts of classes with 1545 enrolled students. Most of the students are bonfire residents of the barangay. There are eight science teachers and five master teachers who earned graduate studies to continuously deepen their expertise in a specific discipline or subject they are teaching and for the opportunities of career advancement, personal fulfillment, empowering learners and individuals to make significant contribution to their chosen fields. CES also offers Alternative Learning System (ALS) classes for out of school youth in the barangay. It offers Accreditation and Equivalency (A & E) Elementary and Secondary and Computer Basic Literacy. Nemesis I. Yabut Elementary School (NIYES) caters two shifts of classes

with 1680 enrolled students with four science teachers and five master teachers. It has upgraded facilities provided by the city that will be utilized in the teaching and learning instruction to equip their learners both regular and ALS with optimum knowledge and develop the necessary skills to become functional and responsible citizens. It has programs, projects and activities to strengthen parent – teacher collaboration that will lead to the total development and formation of the learners. Pitogo Elementary School (PiES) caters a single shift of classes for a total number of 1263 enrollees with four science teachers and five master teachers. It has also functional laboratories, and library designed to foster innovative learning experiences for both regular and ALS learners. Pitogo Elementary School is an APPES (Accreditation Program for Public Elementary School) Level II. San Jose Elementary School (SJES) has two shifts of classes to cater the 1130 total of enrollees with six science teachers and four master teachers. The school is a great place to teach and learn. Aside from the updated and upgraded educational learning resources provided by the local government, and the consistent support of the parents, its teaching staff are committed, highly motivated and dedicated to provide the students including Alternative Learning System (ALS) learners with the best possible opportunities to grow and develop. South Cembo Elementary School (SCES) is a medium school that offers a comfortable and educational setting with 1430 enrolled students with four science teachers and three master teachers. The school began offering the following short courses in alternative learning systems: Home Care Management, Computer Basic Literacy, and Alternative & Equivalency (A & E), in response to the demands of industry and contemporary technology. The school's facilities are continuously upgraded, improved and renovated to cope with the 21st century education trends. The respondents of this study were thirty (30) science teachers, twenty – two (22) master teachers as module validators and 278 grade 6 students. The researcher used stratified sampling to determine the sample per school with a total of 278 as culled out from the population of 996 at 95% level of confidence and a margin of error at his study utilized the following research instrument to gather the needed data. A survey checklist is valuable tool for ensuring that all aspects of a survey are thoroughly considered and executed. It helps in organizing the process, ensuring consistency, and improving the reliability and validity of the survey results. The questionnaires from the DepEd and MERLOT were adapted and modified by the researcher to collect and gather feedback from the evaluation of the two groups of respondents as to the effectiveness with regard to Most Essential Learning Competencies (MELCs), instructional design and organization, instructional quality of text and visuals, assessment, readability, usability, referencing and source citation, and monitoring and review and the researcher's developed ILR features: instructional design and organization, instructional quality of text and visuals, assessment, readability, usability, referencing and source citation, and privacy and data protection and rights. The 4 Likert Scale was used in evaluating the SLM and the developed ILR. This instrument is used to systematically evaluate and interpret documents to extract useful information, gain insights, and develop a deeper understanding of the subject under study. The students' results on the pretest and posttest scores were one of the sources in analyzing the effectiveness of the SLM and the bases in designing and developing the ILR. This instrument allows for a more natural flow of conversation, adapting to the interviewee's responses and the context of the discussion in a more relaxed, and an open-minded dialogue. The researcher conducted informal interview to the respondents to solicit feedback regarding the points they considered in the evaluation of the learning resources (SLM & ILR). The survey instruments for the evaluation of SLMs and ILR and the pretest and posttest test items were validated by the subject matter experts in the field. Validator 1 is currently the Principal II of the Maximo Estrella Senior High School in DepEd Makati City. He finished his Doctor of Education, Major in Innovative Educational Management in 2018 at the University of Makati. He taught science subject for 15 years. Moreover, he was also a recipient of the annual award given by the Rotary Club Makati – Dasmarinas Village in their Search for the Most Outstanding Teacher in DepEd Makati in Conducting Action Research in. His two action research were chosen and published in the International Journal of Learning, Teaching and Educational

Research and Papyrus, the official DepED Makati Research Journal. Before he became a school head, he was the Division Science Supervisor where he spearheaded the crafting of self – learning modules used during the COVID -19 pandemic from Grades 3 to 12 levels. Validator 2 is the recent School Principal II in Cembo Elementary School. Prior to becoming a school head, he was a classroom science teacher and a Master teacher I in Pitogo Elementary School. Validator 3 is the school head of Francisco Benitez Elementary School III – Makati. He was awarded as Most Innovative Teacher. Also, he was recognized as a National Winner in Science Quest 2014 for Strategic Intervention Materials in Science, Teacher Researcher Silver Award and Agri – Green Recognition Award in Kashiong, Taiwan, 2015, Filipino Exchange Teacher Korea – Philippines Teacher Exchange Program in South Korea, and a National Validator for Global Citizenship Education Lesson Exemplars, Mr. Borlado, was elected as a president for Association of Division Elementary Schools Science Club Adviser (ADESSCA) in SDO – Makati. Validator 4 completed her doctor of education in the University Of Makati Major in Innovative Management. She works in SDO – Makati as a Monitoring and Evaluation Unit Education Program Specialist II. Prior to her recent position. She taught as a classroom teacher in Pitogo Elementary School for 10 years and an instructor in Senior High School. Validator 5 is a Master teacher in Francisco Benitez Elementary School III – Makati. She is pursuing her doctorate degree Major in Educational Management at EARIST Cavite Campus. Mrs. Cobico was chosen as a module validator and writer in the divisional and regional level.

### 3. RESULTS AND DISCUSSION

The four master teachers and a science coordinator verified the validity of the second quarter's pretest and posttest questions. The test questions were based from the Most Essential Learning Competencies following the Bloom's Taxonomy. The corrections were made for misspelled words, improper phrases, and typographical errors in numbers. After the validation of questionnaires, a pilot test was carried out to ascertain the reliability of the instrument. Fifty (50) teachers and fifty (50) sixth – graders from West Rembo Elementary School participated in the survey; they were not among the study's real respondents. All of the instruments that the researcher modified were subjected to a reliability test using Cronbach Alpha, which evaluated the effectiveness of the SLMs and the features of the researcher's designed ILR using a 4-point Likert scale.

**Table 01:** Mean reliability analysis of a four–point liker scale instrument on the evaluation of a self-learning module

Variable	No. of Items	Cranach's Alpha	Interpretation
Most Essential Learning Competencies	7	.794	Acceptable
Instructional Design and Organization	10	.841	Good
Instructional Quality of Text and Visuals	7	.728	Acceptable
Assessment	7	.782	Acceptable
OReadability	8	.732	Acceptable
Usability	6	.815	Good
Referencing and Source Citation	6	.872	Good
Monitoring and Review	8	.844	Good
Mean Reliability		.801	Good

The above data were analyzed using the rule of thumb given by George and Mallery (2003) indicating the following criteria such as:  $\geq 0.9$  – Excellent;  $\geq 0.8$  – Good;  $\geq 0.7$  – Acceptable,  $\geq 0.6$  – Questionable;  $\geq 0.5$  – Poor and  $\leq 0.5$  – Unacceptable. The mean reliability analysis showed that the instrument was good enough to measure what it intends to measure.

**Table 02:** Mean reliability analysis of a four–point likert scale instrument on the evaluation of the developed interactive learning resources

Variable	No. of Items	Cronbach's Alpha	Interpretation
Instructional Design and Organization	10	.753	Acceptable
Instructional Quality of Text and Visuals	7	.743	Acceptable
Assessment	7	.727	Acceptable
Readability	8	.760	Acceptable
Usability	6	.711	Acceptable
Referencing and Source Citation	6	.757	Acceptable
Privacy, Data Protection and Rights	6	.803	Good
Mean Reliability	.751	Acceptable	

The above data were analyzed using the rule of thumb given by George indicating the following criteria such as:  $\geq 0.9$  – Excellent;  $\geq 0.8$  – Good;  $\geq 0.7$  – Acceptable,  $\geq 0.6$  – Questionable;  $\geq 0.5$  – Poor and  $\leq 0.5$  – Unacceptable. The mean reliability analysis showed that the instrument was acceptable to measure what it intends to measure. The development model of interactive learning resources in this study refers to the ADDIE Model. The figure 2 below illustrated the components or processes undertaken in the development of the interactive learning resources. Thod for creating a learning experience that develops and enhances skills and knowledge. The model consists of five phases: A means Analysis; D refers to Design; D means Development; I means Implementation; E refers to Evaluation. In the process, Analysis is considered as the “goal - setting stage”. It is the process of defining what is to be learned, where the focus are the students, identifying gaps and information gathering from the feedback of the science teachers and master teachers on the evaluation of the self – learning modules and the pretest and posttest results of the students in the second quarter. In this phase, a frequency of correct response is done to determine which of the learning competencies in the second quarter are mastered, least mastered of the grade 6 students. It found out that body system competencies were in average mastery level. After finding the results, the next step is to design the learning resources. Design is the process of specifying how learning will occur that includes learning objectives, content, lesson planning, activities, assessment and media selection. The researcher thought of the learning resources which is designed for digital learners and for digital age of education that may augment the engagement of the students in learning science and eventually will improve the mastery level on the certain competency. The next step, the researcher looked and worked with the app developer for the development of the interactive learning resources .Development is the process of authoring and producing materials. In this stage, the researcher made use of the data collected and used this information and coordinated with the app developer to create the interactive learning resources which is called SMARTMODU “Learn Smart, Learn Digital” that will relay what needs to be taught to grade 6 students in Science. After the development of the interactive learning resources, the next phase is implementation. In Implementation phase, this is the phase of installing, and continuous modification of researcher’s developed interactive learning resources in the teaching Science to make sure maximum efficiency and positive results are obtained. In this phase, the researcher conducted a demonstration to the respondents on how to navigate the features of the interactive learning resources and how it will help the teaching and learning process so that the design can be continuously evaluated for further

improvement. Since this stage gains much feedback from the three groups of participants alike initial evaluation can start here, the results can be learned and the needed improvement can be addressed. The respondents sought using the criteria of evaluating developed interactive learning resources. The Evaluation stage is the process of determining the impact of the material by undergoing meticulous testing regarding the what, how, why, when of the interactive learning resources material will be accomplished. The main goal of the evaluation stage is to determine if the goals have been met, and to establish what will be required moving forward in order to further determine the effectiveness of the researcher's developed interactive learning resources. The model contains the basic processes of instructional design that can be formulated to ensure that learning does not occur disorganized, and the outcomes can be measured for use in the teaching and learning process. The researcher formally requested an approval from the Superintendent of the Schools Divisions in Makati and TAPAT (Taguig and Pateros) to carry out the study to gather the relevant data. Following the Data Privacy Act of, the researcher provided a letter of support for the request to the administrators of the schools and obtain parental permission for the students who participated in the study. The researcher distributed the survey - questionnaires to the respondents with the consent of the school administrators and parents and analyzed & interpreted the information received from the three groups of respondents.

**Table 03:** Evaluation of science teachers and module validators on the self-learning module in science in terms of most essential learning competencies

Indicators	Science Teachers			Module Validators		
	Mean	SD	Interpret	Mean	SD	Interpret
Covers the targeted Most Essential Learning Competencies intended for the quarter.	4.00	0.00	Strongly Agree	3.95	0.21	Strongly Agree
Sufficiently develops the targeted Most Essential Learning Competencies intended for the quarter	3.97	0.18	Strongly Agree	3.95	0.21	Strongly Agree
Clearly states the Most Essential Learning Competencies intended for the learning session.	3.97	0.18	Strongly Agree	4.00	0.00	Strongly Agree
Uses the Most Essential Learning Competencies suited to the cognitive, affective, and psychomotor level of the learners.	3.73	0.45	Strongly Agree	3.91	0.29	Strongly Agree
States efficient Most Essential Learning Competencies that learners could learn a lot in a short period of time.	3.87	0.43	Strongly Agree	3.91	0.29	Strongly Agree
States the Most Essential Learning Competencies that can be used to measure student learning outcomes.	3.93	0.25	Strongly Agree	3.95	0.21	Strongly Agree
Has Most Essential Learning Competencies that are easy to integrate across learning areas.	3.83	0.21	Strongly Agree	3.82	0.50	Strongly Agree



Composite	3.90	0.25	Strongly Agree/Highly Evident	3.93	0.25	Strongly Agree/Highly Evident
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In terms of MELCs, the evaluation of self-learning module in Science yielded the same overall implications in the responses of the science teachers and module validators. Generally, both groups of respondents strongly agreed that the contents of the self-learning module had demonstrated the most essential learning competencies of the students. This means that it is highly evident the self-learning module covers sufficiently and clearly states the targeted most essential learning competencies intended for the quarter suited to the cognitive, affective, and psychomotor level of the learners and that are easy to integrate across learning areas. Of all the indicators, the highest mean score of 4.00 in the evaluation of science teachers was perfectly evident by covering the targeted Most Essential Learning Competencies intended for the quarter, while in the evaluation of module validators, the highest mean score of 4.00 was perfectly evident by clearly stating the Most Essential Learning Competencies intended for the learning session. Indeed, clearly stating learning competencies in the self-learning module enhances the effectiveness of the learning experience by providing direction, motivation, and a basis for assessment and progress tracking. This finding was braced with the statement of USC Blackboard that a learning module is a structured grouping of information that is given collectively that can assist with a course objective, goal, subject, idea, or theme in a logical, sequential manner, assisting students in progressing through the subject and examinations in the order designated by the instructor. In addition to, Pupin, who recommended that teachers make sure the students are aware of the modules' objectives, purposes, and learning outcomes and see that modules are constructively aligned to the most essential learning competencies. On the other hand, the lowest mean score of 3.73 among their evaluations was apparent by use of Most Essential Learning Competencies suited to the cognitive, affective, and psychomotor level of the learners, while for the module validators, the lowest mean score of 3.82 was apparent by the characteristics of the self-learning module to have Most Essential Learning Competencies that are easy to integrate across learning areas. However, the study of Sequeira stated that self-learning modules are designed where the learner is free to choose what to learn, how to learn, when to learn, and where to learn. Furthermore, Bacomo cited that students' attitude is a compelling factor that is related with performance; hence module writers should further contextualize the learning materials that can compound learner's disposition and academic performance. It can be gleaned in the table that the module validators gained a composite mean of 3.93 which is higher than the science teachers with a composite mean of 3.90. Statistically, the module validators play a crucial role in ensuring that the contents of the SLM covers in enough detail the targeted most important learning competencies intended for the quarter that is easy to integrate across learning domains and appropriate for the learners' cognitive, emotional, and psychomotor levels.

**Table 04:** Evaluation of science teachers and module validators on the self-learning module in science in terms of instructional design and organization

Indicators	Science Teachers			Module Validators		
	Mean	SD	Interpret	Mean	SD	Interpret
Contains learning objectives that are anchored on the MELCs.	3.93	0.25	Strongly Agree	3.95	0.21	Strongly Agree
Utilizes (at least 3) of self-directed techniques, learning	3.80	0.41	Strongly Agree	3.95	0.21	Strongly Agree

tasks, and formative assessments.						
Presents content that is logically developed and organized, i.e., lessons/ activities are arranged from simple to complex, from observable to abstract.	3.80	0.41	Strongly Agree	3.95	0.21	Strongly Agree
Contains essential instructional design elements that contribute to the achievement of learning objectives.	3.87	0.35	Strongly Agree	4.00	0.00	Strongly Agree
Provides opportunities for learners to review and connect the current and the previous lesson.	3.93	0.25	Strongly Agree	3.95	0.21	Strongly Agree
Uses various motivational strategies (i.e; advance organizers, puzzles, games) to hook the learners' interest and engagement.	3.70	0.47	Strongly Agree	4.00	0.00	Strongly Agree
Uses process/guide questions and activities which require different levels of the cognitive domain to achieve desired learning outcomes.	3.93	0.25	Strongly Agree	3.95	0.21	Strongly Agree
Provides differentiated written and performance tasks based on the target learners' multiple intelligences, learning styles, and readiness levels.	3.80	0.41	Strongly Agree	3.95	0.21	Strongly Agree
Develops 21 <sup>st</sup> century skills and higher-order cognition (i.e., critical thinking, creativity, learning by doing, problem-solving).	3.90	0.31	Strongly Agree	3.91	0.29	Strongly Agree
Integrates desirable values and traits.	3.87	0.35	Strongly Agree	3.95	0.21	Strongly Agree
Composite	3.85	0.34	Strongly Agree/Highly Evident	3.96	0.18	Strongly Agree/Highly Evident

In terms of instructional design and organization, the evaluation of self-learning module in Science yielded the same overall implications in the responses of the science teachers and module validators. Generally, both groups of respondents strongly agreed that the self-learning module highly demonstrated instructional design and organization. Meaning it is highly evident the SLM contains learning objectives that are anchored on the MELCs and integrate desirable values and traits, utilize of self-directed techniques, differentiated learning tasks, and formative assessments, various motivational

strategies advance organizers, puzzles, games, guide questions and activities that require different level of the cognitive domain), based on the target learners' multiple intelligences, learning styles, and readiness levels that develop the 21st century skills of the learners such as critical thinking, creativity, and problem -solving skills, provide opportunities for learners to review and connect the current and the previous lesson and to hook the learners' interest and engagement. Specifically, the highest mean score among the evaluations of science teachers was equally evident by these indicators with a mean of 3.93 such as: 1) Contains learning objectives that are anchored on the MELCs; 2) Provides opportunities for learners to review and connect the current and the previous lesson and; 3) Uses process/guide questions and activities which require different levels of the cognitive domain to achieve desired learning outcomes. On the part of module validators, the highest mean score of 4.00 among their evaluations was similarly evident by having essential instructional design elements that contribute to the achievement of learning objectives and, using various motivational strategies Advance organizers, puzzles, games) to hook the learners' interest and engagement. Absolutely, integrating these elements into learning modules enhances the effectiveness of teaching and learning by promoting alignment with learning goals, facilitating continuity and retention, fostering deep understanding, encouraging active engagement, supporting differentiation, and enabling ongoing assessment of learning progress. This finding is backed by the study of Xia who emphasized that in order to build interesting learning environments, a number of approaches are being researched, including "gamified learning, virtual simulations, and individualized learning modules" and interactive learning fueled by technology has the potential to transform education by promoting involvement, improved understanding, and individualized education. In the same way, Burge emphasized that in designing effective teaching modules must come in three ways: a. clear about the module purposes and aspirations for student participants and communicate these to students which means it is crucial to have definite, doable objectives for the module, b. constructively aligned, and c. considering the course in the context Contrariwise, the science teachers revealed that the lowest mean score of 3.70 among their evaluations was equally apparent by the indicator Uses various motivational strategies advance organizers, puzzles, games) to hook the learners' interest and engagement while the module validators disclosed that the lowest mean score of 3.91 was apparent by developing 21st century skills and higher-order cognition (i.e., critical thinking, creativity, learning by doing, problem-solving). Even so, the study of Matanlukab demonstrated that the implementation of the geography teaching module can enhance students' critical-thinking abilities and that a student-centered approach can motivate them to actively engage in the pursuit of knowledge. Moreover, Gutierrez advised instructors to use cutting-edge and engaging instructional tools while teaching science because doing so may help them meet students' willingness to learn the subject in a meaningful way and gauge the amount of their prior knowledge. Also, Lim who cited those students performed significantly better in Math specifically word problem-solving through modular instruction. It can be viewed in the table that the module validators got the composite mean of 3.96 which is higher than the science teachers with a composite mean of 3.85. Generally, it is the position of the module validators to check how the content, activities, and assessments within the module are structured and arranged to optimize learning outcomes. While the science teachers are more focused on the content that provides differentiated tasks based on the target learners' multiple intelligences, learning styles, and readiness levels to hook their interest' and engagement.

**Table 05:** Evaluation of science teachers and module validators on the self-learning module in science in terms of instructional quality text and visuals

Indicators	Science Teachers			Module Validators		
	Mean	SD	Interpret	Mean	SD	Interpret

Has all contents that are accurate.	3.73	0.45	Strongly Agree	3.95	0.21	Strongly Agree
Has free from factual errors.	3.73	0.52	Strongly Agree	3.86	0.35	Strongly Agree
Has contents that are readable.	3.87	0.35	Strongly Agree	3.86	0.47	Strongly Agree
Has clear and easy to follow instructions and explanations.	3.83	0.38	Strongly Agree	3.91	0.29	Strongly Agree
Has visuals such as diagrams, illustrations that is a good help for learners in understanding the scientific concepts.	3.97	0.18	Strongly Agree	4.00	0.00	Strongly Agree
Maintains the interest of the learners throughout the learning process.	3.97	0.18	Strongly Agree	3.91	0.29	Strongly Agree
Is visually appealing.	3.77	0.43	Strongly Agree	3.82	0.39	Strongly Agree
Composite	3.84	0.36	Strongly Agree/Highly Evident	3.90	0.29	Strongly Agree/Highly Evident

In terms of instructional quality texts and visuals, the evaluation of self-learning module in Science yielded the same overall implications in the responses of the science teachers and module validators. Generally, both groups of respondents strongly agreed that the self-learning module highly demonstrated quality texts and visuals. This signifies that it is highly evident in the SLM the contents are accurate, readable, instructions and explanations are easy to follow, free from factual errors, diagrams, and illustrations are visually appealing to maintain the interest of the learners throughout the learning process and are of great help for learners' in understanding the scientific concepts. Of all the indicators, the highest mean score of 3.97 among the evaluations of science teachers and module validators with a mean score of 4.00 was similarly evident by having visuals such as diagrams, illustrations, that is a good help for learners in understanding the scientific concepts and; maintaining the interest of the learners throughout the learning process. Positively, they provide a concrete representation of abstract ideas, making them easier for learners to understand. They can convey information quickly and succinctly. Instead of relying solely on lengthy textual descriptions. Colorful diagrams, engaging illustrations, and interactive graphics can make the material more engaging and stimulating, motivating learners to actively participate in the learning experience. Results were aided by the study of Divecha who revealed reading text matter can often get monotonous for the readers and using visually appealing and easy to understand charts, tables, figures, illustrations, and graphs break from textual monotony as well as provides an opportunity to process and connect information between text and images, sustains readers' interest and promotes deeper learning. In the same way Saunders & Wong (2020) emphasized that instructional materials provide the basis for what learners will experience and learn. They hold the power to either engage or demotivate learners. The science teachers revealed that the lowest mean score of 3.73 was equally apparent by the accuracy of the contents of self-learning module as well as its status of being free from factual errors while the module validators' evaluation the lowest mean score of 3.82 was apparent by the characteristics of the self-learning module to be visually appealing. In spite of that Goode supported the notion that quality assurance is a much-needed component in developing learning materials, especially when developing

stand-alone, self-paced learning modules with limited or no human interaction. Similarly, Hamweete said, it is essential to ensure that where course delivery is concerned, this should be of the highest quality possible, especially as it relates to learning modules where the teachers and students depend on them for teaching and studying purposes. It can be observed in the table above that the module validators yielded composite mean of 3.90 which is higher than the science teachers with a composite mean of 3.84. Simply, the module validators prioritize ensuring the instructional quality of both text and visuals within a SLM for clarity and comprehensibility, accuracy and precision, engagement and interest, relevance and alignment, and instructional design principles.

**Table 06:** Evaluation of science teachers and module validators on the self-learning module in science in terms of assessment

Indicators	Science Teachers			Module Validators		
	Mean	SD	Interpret	Mean	SD	Interpret
Provides sufficient assessment activities that will help the learner track his/her progress and mastery of the target competencies.	3.93	0.25	Strongly Agree	3.95	0.21	Strongly Agree
Uses assessments that are aligned with the specific objectives and contents (i.e., lesson/topic).	4.00	0.00	Strongly Agree	4.00	0.00	Strongly Agree
Provides at least three different assessment types in the lesson.	3.93	0.25	Strongly Agree	3.95	0.21	Strongly Agree
Contains assessments that have clear instructions, and /or rubrics to serve as a guide on how these will be used.	3.90	0.31	Strongly Agree	3.91	0.29	Strongly Agree
Contains has assessment activities that keep the active engagement of the learners.	3.87	0.43	Strongly Agree	3.91	0.29	Strongly Agree
Has answer keys that provide exact answers for objective-type assessments and discussion points for non-objective types.	3.73	0.69	Strongly Agree	3.59	0.96	Strongly Agree
Allows learners to take the pre- and post-assessment items to measure the learning before and after the lesson.	3.97	0.18	Strongly Agree	3.86	0.47	Strongly Agree
Composite	3.90	0.30	Strongly Agree/Highly Evident	3.88	0.35	Strongly Agree/Highly Evident

In terms of assessment, the evaluation of self-learning module in Science yielded the same overall implications in the responses of the science teachers and module validators. Generally, both groups of respondents strongly agreed that the self-learning module highly demonstrated assessment of learning. This denotes that it is highly evident that assessment activities in SLM are sufficient and aligned with the specific objectives and contents, clear instructions/rubrics, engaging activities, exact answer keys, and allow the learners to take the pretest and posttest that will help the learner track his/her progress

and mastery of the target competencies. Particularly, both science teachers and module validators similarly evaluated that the highest mean score of 4.00 among their evaluations was perfectly evident by the use of assessments that are aligned with the specific objectives and contents (i.e., lesson/topic). Surely, aligning assessments with specific objectives and content within learning modules ensures validity, clarity, relevance, feedback, accountability, motivation, and supports continuous improvement in the teaching and learning process. The results were supported with the study of Partner 4Results who expound those aligning assessments, learning objectives and instructional strategies is critical for effective teaching and learning. Correspondingly, Geneon & Torres figured out that students' achievement and the opportunity to learn is at optimum level when lesson plans are aligned with benchmarks, standards, and assessments. While the lowest mean score 3.73 for the science teachers and 3.59 for the module validators was apparent by having the answer keys that provide exact answers for objective-type assessments and discussion points for non-objective types. Nonetheless, Sabel found out that providing enhanced answer keys, reflection questions and scaffolds instruction helped students to engage in metacognition, develop greater understanding of biological concepts and gain higher learning. It can be drawn from the table above that science teachers obtained the composite mean of 3.90 which is higher than the module validators with a composite mean of 3.88. Normally, the module validators play a vital role in ensuring the overall quality and integrity of learning modules while the specialized knowledge, experience, and perspective of science teachers contribute significantly to the evaluation process, resulting in higher mean values for their assessments.

**Table 07:** Evaluation of science teachers and module validators on the self-learning module in science in terms of readability

Indicators	Science Teachers			Module Validators		
	Mean	SD	Interpret	Mean	SD	Interpret
Uses vocabularies that are appropriate to the target learners' level of comprehension and experience.	3.90	0.31	Strongly Agree	4.00	0.00	Strongly Agree
Uses sentence structures suited to the comprehension level of the target learners.	3.97	0.18	Strongly Agree	4.00	0.00	Strongly Agree
Uses paragraph structures that facilitate a smooth flow of ideas and concepts.	3.93	0.25	Strongly Agree	4.00	0.00	Strongly Agree
Has instructions, questions, activities appropriate for the target learners.	3.93	0.25	Strongly Agree	4.00	0.00	Strongly Agree
Utilizes texts, words, figures, charts, that are clear and easy to read.	3.83	0.38	Strongly Agree	4.00	0.00	Strongly Agree
Uses uniform font style and font size throughout the module.	3.80	0.55	Strongly Agree	3.95	0.21	Strongly Agree
Uses illustrations that are attractive and appealing to the target learners.	3.80	0.41	Strongly Agree	3.86	0.35	Strongly Agree
Reinforces concepts progressively.	3.90	0.31	Strongly Agree	3.82	0.50	Strongly Agree

Composite	3.88	0.33	Strongly Agree/Highly Evident	3.95	0.13	Strongly Agree/Highly Evident
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In terms of readability, the evaluation of self-learning module in Science yielded the same overall implications in the responses of the science teachers and module validators. Generally, both groups of respondents strongly agreed that the self-learning module highly demonstrated its readability. This represents that is highly evident in the SLM that texts (font style and font size), words, figures, charts, illustrations, vocabularies, sentence/paragraph structures reinforce the concepts progressively and are appropriate, appealing, easy to read, and suited to the target learners' level of comprehension and experience. Particularly, the use of sentence structures suited to the comprehension level of the target learners generated the highest mean score of 3.97 among the evaluations of science teachers. Certainly, having clear and concise sentence structures facilitate understanding. When sentences are crafted to match the comprehension level of learners, they can more easily grasp the intended message without confusion or misinterpretation. It also encourages active participation in the learning process, supports memory retention by minimizing cognitive load and allowing learners to focus on the key concepts being presented. Supports of the findings were the study of who revealed that textual features that make problems more difficult to process appear to differentially negatively impact struggling students, while features that make language easier to process appear to differentially positively impact struggling students. In the same way Readability Matters expound that readability is the about the reader, the ease with which reader can successfully decipher, process, and make meaning of the text read. Although, the use of uniform font style and font size throughout the module and, the use of illustrations that are attractive and appealing to the target learners equally yielded the lowest mean score of 3.80 in evaluations of the same respondents still Divecha ( explained that reading text matter can often get monotonous for the readers and using visually appealing and easy to understand charts, tables, figures, illustrations, and graphs break from textual monotony as well as provides an opportunity to process and connect information between text and images, sustains readers' interest and promotes deeper learning. Furthermore, the module validators disclosed that the highest mean score of 4.00 among their evaluations was equally evident by the following indicators such as: 1) use of vocabularies that are appropriate to the target learners' level of comprehension and experience; 2) use of sentence structures suited to the comprehension level of the target learners use of paragraph structures that facilitate a smooth flow of ideas and concepts having instructions, questions, activities appropriate for the target learners and utilization of texts, words, figures, charts, that are clear and easy to read. The findings were backed by the study of DuBay expound that readability is tightly related to reading comprehension, retention, reading speed, and persistence. In like manner Chidinma & Osomkume explained that comprehension of the material read depends largely upon the level of difficulty of the material. Contrariwise, the lowest mean score of 3.82 was apparent by reinforcing concepts progressively still and all as stated in Instructure Community, modules are used to divide up the course material into weeks, units, or other categories. What students should do in a course is primarily created by modules as a one-directional linear flow. It can be posited in the table that the module validators obtained the composite mean of 3.95 which is greater than the science teachers with a composite mean of 3.88. This means the science teachers bring valuable subject-specific knowledge and insights to the evaluation process. While the module validators may offer a broader perspective and specialized expertise in readability assessment, leading to higher mean values in their evaluations

**Table 08:** Evaluation of science teachers and module validators on the self-learning module in science in terms of usability

Indicators	Science Teachers			Module Validators		
	Mean	SD	Interpret	Mean	SD	Interpret
Is easy to use.	3.93	0.25	Strongly Agree	4.00	0.00	Strongly Agree
Has very clear instructions.	3.90	0.31	Strongly Agree	3.95	0.21	Strongly Agree
Is engaging.	3.80	0.48	Strongly Agree	3.86	0.35	Strongly Agree
Is free from accessibility issues that hindered the ability of the teachers and the learners to use the learning module effectively (readability, color contrast, font size and style).	3.87	0.35	Strongly Agree	3.91	0.29	Strongly Agree
Can be used on multiple types of mobile devices and platforms.	3.90	0.31	Strongly Agree	3.86	0.47	Strongly Agree
Can be accessed without the internet (offline).	3.93	0.25	Strongly Agree	3.86	0.35	Strongly Agree
Composite	3.89	0.32	Strongly Agree/Highly Evident	3.91	0.28	Strongly Agree/Highly Evident

In terms of usability, the evaluation of self-learning module in Science yielded the same overall implications in the responses of the science teachers and module validators. Generally, both groups of respondents strongly agreed that the self-learning module highly demonstrated its usability. This means that it is highly evident the SLM is easy to use, engaging, has very clear instructions, free from accessibility issues that hindered the ability of the teachers and the learners to use the learning module effectively (readability, color contrast, font size and style) and can be accessed on multiple types of mobile devices and platforms with or without the internet. Specifically, the science teachers disclosed that the highest mean score of 3.93 among their evaluations was equally evident by the attributes of the self-learning module to easily use and accessible even without an internet connection. Truly, ensuring that learning modules are easily usable and accessible offline expands access to education, provides flexibility for learners, ensures continuity of learning, reduces costs, conserves resources, enhances privacy and security, and enables customization, ultimately contributing to more inclusive and equitable learning experiences. The results were attested to the study of who emphasized that the characteristics of the learning module include self-contained, stand-alone, self-instructional, user-friendly, adaptive, and consistent. Likewise, Cramer found out that the students who completed modules indicated that they enjoyed them, scoring significantly higher on their final examination. Also, Valencia, revealed that using modules in teaching grade 10 science evidently showed positive results and displayed a vital connection in increasing student's achievement. Furthermore, the same respondents revealed that the lowest mean score of 3.80 on the usability of self-learning module was apparent by its attribute to be more engaging. On the part of module validators, the highest mean score of 4.00 was perfectly evident by the characteristics of the self-learning module for being easy to use while the lowest mean score of 3.86 was equally apparent by the following indicators such as the module is engaging the module can be used on multiple types of mobile devices and platforms and the module can be accessed without the internet. For all that, as defined by Nielsen that usability is a quality attribute that assesses how easy user interfaces and has the following quality component: learnability,



efficiency, memorability, error tolerance, and user's satisfaction. It can be seen in the table that the module validators obtained the composite mean of 3.91 which is higher to the science teachers' evaluations with a composite mean of 3.89. Broadly, the module validators offer a specialized expertise in usability evaluation that enhances the overall quality and usability of learning materials. Module validators approach usability evaluation with a more objective perspective, focusing on established usability principles and guidelines.

**Table 09:** Evaluation of science teachers and module validators on the self-learning module in science in terms of referencing and source citation

Indicators	Science Teachers			Module Validators		
	Mean	SD	Interpret	Mean	SD	Interpret
Copyrighted texts and visuals are accurately cited on the page where they are presented (i.e., primary and /or sources are cited)	3.77	0.50	Strongly Agree	3.86	0.35	Strongly Agree
References are properly cited in the Reference List	3.80	0.48	Strongly Agree	3.86	0.35	Strongly Agree
Adheres to a citation style recognized academic standard (e.g., APA, MLA)	3.50	0.68	Agree	3.45	0.80	Agree
Has consistency in the citation style used throughout the learning module.	3.63	0.56	Strongly Agree	3.41	0.85	Agree
Provides sufficient references to support the scientific claims and information presented.	3.70	0.53	Strongly Agree	3.77	0.53	Strongly Agree
References are effectively integrated into the content of the learning module.	3.70	0.53	Strongly Agree	3.82	0.39	Strongly Agree
Composite	3.68	0.55	Strongly Agree/Highly Evident	3.70	0.55	Strongly Agree/Highly Evident

In terms of referencing and source citation, the evaluation of self-learning module in Science yielded the same overall implications in the responses of the science teachers and module validators. Generally, both groups of respondents strongly agreed that the self-learning module highly demonstrated its referencing and source citation. This denotes that it is highly evident the references and source citation in the SLMs are accurately cited, sufficient to support the scientific claims and information presented, and effectively integrated into the content throughout the learning module. Of all the indicators, the science teachers revealed that the highest mean score of 3.80 among their evaluations was evident by the references that are properly cited in the reference list while the lowest mean score of 3.63 was apparent by the consistency of the self-learning module in the citation style used throughout the learning module. the other hand, the module validators disclosed that the highest mean score of 3.86 among their evaluations was similarly evident by the Copyrighted texts and visuals are accurately cited on the page where they are presented (i.e., primary and /or sources are cited) and, the references are properly cited in the reference list. Indeed, accurately citing copyrighted texts and visuals in a learning

module is essential for legal compliance, ethical considerations, transparency, accountability, scholarly communication, quality assurance, avoidance of misinformation, support for further exploration, and credit to contributors. It upholds academic integrity and enhances the credibility and trustworthiness of the educational material. In support to this finding, UNSW Sydney that defined referencing as a way to provide evidence to support assertions and claims, give credit to the writers from whom you have borrowed words and ideas, and allow you to acknowledge the contribution of other writers and researchers. Likewise, Academic Assignments (2023) also explained that referencing and citation are crucial in supporting the credibility and authenticity of the writing. Contrariwise, the lowest mean score of 3.41 was apparent by the attribute of the self-learning module for having consistency in the citation style used throughout the learning module. However, Bouchrika wrote that citing sources properly is also important because you can easily establish to your reviewers and readers the context around and relevancy of your work in any of the following common formats: IEEE, MLA, Chicago/Turabian, APA, or MLA. It can be viewed in the table that the module validators' evaluations obtained the composite mean of 3.70 which is higher than the evaluations of the science teachers with a composite mean of 3.68. Generally speaking, module validator's offer specialized expertise in academic standards, citation styles, and scholarly conventions that enhances the overall quality and credibility of referencing and citation practices in learning modules. While teachers bring valuable insights into referencing and citation practices based on their instructional experience and interactions with students.

**Table 10:** Evaluation of science teachers and module validators on the self-learning module in science in terms of monitoring and review

Indicators	Science Teachers			Module Validators		
	Mean	SD	Interpret	Mean	SD	Interpret
Gather feedback from the field to improve the material.	3.77	0.43	Strongly Agree	3.86	0.47	Strongly Agree
Conduct post evaluation meeting with the teachers to validate feedback.	4.00	0.00	Strongly Agree	3.68	0.65	Strongly Agree
Integrate the validated feedback from the field for improvement of the material.	3.93	0.25	Strongly Agree	3.91	0.29	Strongly Agree
Provide systematic and standardized tool to review the material.	3.80	0.41	Strongly Agree	3.59	0.73	Strongly Agree
Involve teachers and learners in the monitoring and review of the materials.	2.93	0.78	Agree	3.45	0.86	Agree
Communicate to the field the changes of the material as part of the regular monitoring and review of the material.	3.77	0.43	Strongly Agree	3.73	0.55	Strongly Agree
Activities are appropriate in terms of difficulty and complexity.	3.90	0.31	Strongly Agree	3.68	0.48	Strongly Agree
Undergoes weekly, monthly, quarterly or yearly monitoring	3.07	1.01	Agree	3.00	0.93	Agree

and review by the module validators and supervisor.						
Composite	3.65	0.45	Strongly Agree/Highly Evident	3.61	0.62	Strongly Agree/Highly Evident

In terms of monitoring and review, the evaluation of self-learning module in Science yielded the same overall implications in the responses of the science teachers and module validators. Generally, both groups of respondents strongly agreed that the self-learning module highly demonstrated its monitoring and review. This represents that it is highly evident the SLMs undergo monitoring and review to check that all contents such as activities are aligned and appropriate in terms of difficulty and complexity, conduct post evaluation meeting with the teachers to validate feedback using the systematic and standardized tool, integrate the validated feedback from the field for improvement of the material and changes of the material must be communicated to the field. Particularly, the highest mean score of 4.00 in the evaluation of science teachers was perfectly evident by conducting post evaluation meeting with the teachers to validate feedback. Indeed, conducting evaluation meetings with teachers ensures that learning modules are evidence-based, relevant, and tailored to the needs of both educators and students, ultimately enhancing the quality of education delivery. The finding was supported by the study of Hamweete who said, it is essential to ensure that where course delivery is concerned, this should be of the highest quality possible, especially as it relates to learning modules where the teachers and students depend on them for teaching and studying purposes. While the lowest mean score of 2.93 was apparent by involving the teachers and learners in the monitoring and review of the materials. The other indicator that obtained lower mean score of 3.07 in the evaluation of science teachers was also apparent by undergoing weekly, monthly, quarterly or yearly monitoring and review by the module validators and supervisor. On the other hand, the module validators disclosed that the highest mean score of 3.91 among their evaluations was evident by integrating the validated feedback from the field for improvement of the material. A study disclosed that a review be done before sending the modules to the students, a more extended time allotment and sufficient concrete examples are given and the concerned faculty are encouraged to review the phases involved in the design, development, and distribution of the instructional modules to make them highly acceptable and very satisfactory to the students while maintaining the quality of both the content and aesthetics of the learning materials. While the lowest mean score of 3.00 was apparent by undergoing weekly, monthly, quarterly or yearly monitoring and review by the module validators and supervisor. However, the studies of Goode and Hamlet supported the idea that quality assurance of the SLMs is crucial. Likewise, stated that improving the quality of learning modules is a continuous and instructional design is a crucial process and that ensuring the quality of writers is pertinent. Who implied that by understanding the importance of monitoring and review (evaluation), organizations can ensure that their programs are efficient, effective, and impactful, leading to improve program outcomes and sustainable results. In addition, found out that monitoring and evaluation and lecturer's active role can bring impacts on teaching productivity and can improve institutional ability to develop institutional plan. The table above shows that the science teachers' evaluations obtained the composite mean of 3.65 which is higher than the module validators' evaluations with a composite mean of 3.61. The results could imply that science teachers find the learning modules more practical and feasible to use in their teaching. Teachers are the ones directly implementing the learning modules in the classroom. Higher mean values from teachers could indicate that the modules are perceived as more effective or relevant in real-world teaching contexts. This could suggest that teachers believe the modules effectively engage students, facilitate understanding, and support the attainment of learning objectives.

## Discussion

Science education should be an essential component of a learning continuum for all, from pre-school to active engaged citizenship. It should focus on competencies with emphasis on learning through science and linking science with other subjects and disciplines. Worth explained that there is a growing understanding and recognition of the power of children's early thinking and learning as well as a belief that science may be a particularly important domain in early childhood, serving not only to build a basis for future scientific understanding but also to build important skills and attitudes for learning [22]. Holbrook emphasized that policy-makers and teachers should rethink their vision of science in the school curriculum and accept the view that teaching of science subject is part of the overall educational provision and must not be viewed in a different philosophical light from other subjects. In RA 10533 also known as the "Enhanced Basic Education Act of 2013", the K to 12 science curriculum envisions the development of scientifically, technologically, and environmentally literate and productive members of society who are critical problem solvers, responsible stewards of nature, innovative and creative citizens, informed decision makers, and effective communicators [23]. The science curriculum recognizes the place of science and technology in everyday human affairs. A learning module aids pupils in becoming fully engaged with the idea or lesson you're teaching. Modules are an efficient and logical approach to group content to meet the pace of these resources whether a textbook or other materials serve as the foundation for your course curriculum. As an alternative, you can let learners study the material in a learning module in any sequence and at their own pace [24]. Pupin recommended that teachers make sure the students are aware of the modules' objectives, purposes, and learning outcomes and see that modules are constructively aligned to the most essential learning competencies (MELCs). This adaptability is a crucial quality in the open learning process. The various forms of instruction are gradually vanishing as a result of the development of information technology for communication [25].

## 4. CONCLUSION

Based on the study's findings and conclusions, the following suggestions were formed. It is encouraged that both teachers and students would keep incorporating self-learning modules into the curriculum since they have been shown to be successful in raising students' academic performance. It is anticipated that in order to guarantee the effectiveness of the self-learning module, DipEd officials will carry out ongoing monitoring and reviews. The researcher and future researchers are anticipated to carry out additional research on the possible effectiveness of the created interactive learning resources. In relation to testing the possible effectiveness of the interactive learning resources (SMART MODU), it is recommended that the school administrators may include in their trainings (INSET, LAC, PLC) so that teachers, students and even parents may appreciate the beauty of the learning resources and understand the value of technology in the teaching and learning process and as a contributory factor to the development of the students' performance in Science. It is recommended that the researcher will include all the Science lessons from the first to fourth quarter in the application and will fully implement and monitor for sustainability of the resources. It is recommended to enhance some of the features of the application like animations, games, color and contrast, and audio to boost the interest, engagement and to cater the different learning styles of the students. It is hoped that there will be more science teachers will develop learning resources like SMART MODU to hook the interests of the students and to ignite their love in learning science which will eventually enhance their academic performance.

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