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DEVELOPMENT AND EVALUATION OF ELECTRONIC INSTRUCTIONAL MODULE IN MATTER

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Abstract:

The study attempted to develop Electronic Instructional Module and Teacher's Guide in Matter and had it evaluated by Science Teachers, Science Experts, IT Experts, and students using the developmental method of research, and Esquivel (2012) Research and Development Design.

The data pertinent to the study were tabulated, analyzed, and interpreted by means of statistical tools such as weighted mean and standard deviation.

Results revealed that the E-Module featured the following design: it utilized MELCs in conceptualizing the lessons; used Inquiry-based and Interdisciplinary Contextualization approaches as the main frameworks alongside with Cognitive Load Theory, Interactive Learning, Audio-visual Learning and Reflective Learning; Kotobee Author and Kotobee Reader were the main authoring tools used with additional technical implements like Adobe Photoshop, Vexel Art, and Bitmoji; and the E-Module design followed the Alternative Delivery Mode (ADM) Module templated prescribed by DepEd.

After the first draft of the E-Module, it underwent Evaluation Stage by Science Teachers, Science Experts, IT Experts, and students. Using the Evaluation Rating Sheet for Non-Print Materials, the 30 Science Teachers and 10 Science Experts rated all factors (Other Findings, Content Quality, Instructional Quality, and Technical Quality) as "Very Satisfactory." Using the Evaluation Rating Sheet for Non-Print Materials, the 5 IT experts rated the E-Module as "Very Satisfactory."

Based on the Educational Soundness General Evaluation Checklist, Science Teachers, Science Experts, and students evaluated the E-Module as "Very Satisfactory." Both Science Teachers and Science Experts rated the E-Module "Passed" in all four factors namely: Content Quality, Instructional Quality, Technical Quality and Other Findings. Based on the ppercentages of the recommendation of Science Teachers, Science Experts and students on the Electronic Instructional Module in Matter, 80% from the 30 Science Teacher-evaluators recommended the reproduction and distribution of the E-Module in current format and only 20% requires modification of the resource before reproducing, 60% of the 10 Science Expert-evaluators recommended the reproduction and distribution of the E-Module in current format and the remaining 40% requires modification of the resource before reproduction, and lastly, 68.91% of the student-respondents recommended the reproduction of the resource as it is while the 31.08% out of the 74 student-evaluators require modification of the resource before reproducing it.

In the lights of the findings and conclusions, the researcher recommended that the E-Module be subjected for further evaluation to DepEd Central Office Material Resource Evaluation team strictly for following the standard phases of evaluation, check the quality of the E-Module when integrated in online learning platforms like the Learning Management System, Edmodo or Google Classroom

commonly used in Blended Learning Modality or when the E-Module is exported as a web, mobile or desktop app, assess the technical aspect and compatibility of the E-Module in IOS types of smart phones, or other higher versions, evaluate the crafted E-Module using the premium version of Kotobee Author, and implement the developed E-Module in an experimental type of research for further establishment of validity and reliability outcomes.

Keywords: Electronic Instructional Module, Cognitive Load Theory, Interactive Learning, Audio-visual Learning and Reflective Learning; Kotobee Author and Kotobee Reader, Learning Management System, E-Module

1. INTRODUCTION

The struggling ranking of science is still manifested in the studies conducted by TIMSS 2019 and PISA 2018. Despite of the many conducted researches aiming to uplift its present rank in the international education arena, still no best way to do it. Collectively, Science still sags as a major learning area.

Teachers are the one, who prepares and applies the instructional materials and procedures, therefore, they have the full responsibility in checking whether it answers the educational objectives. These objectives must be suited to the assessment and evaluation applied after teaching to verify its effectiveness. Evaluation of students' learning should also be done to check whether the educational objectives have been achieved. But all these things could not be done thoroughly if the instructional materials are not first subjected to evaluation. Truly, teachers play the biggest role in the education field.

"Digital Natives," is a term tagged to our present day learners. This highlights the significance and role of technologies of our learners today. Halton (2019) stated that Mark Prensky first coined the term in his work to illustrate the generation of learners interacting with technology.

Fraillon (2013) included a survey initiated by a reputable international agency (IEA) which reported that in 2011, 53% of the student-respondents, in 21 participating countries have their own internet access at home. (Mullis, 2012). In England, Australia, Slovenia, and Sweden as well as in Canadian provinces of Alberta, Ontario, and Quebec, to name few, the figure reach a higher percentage of 80%.

The digital students of the present generation trigger the educational sectors by developing a new system of approaching the teaching practice in the classroom. It is claimed that this generation has unique characteristics and way of learning. They make significant utilization of technology in their lives especially in social and educational purposes. This is evident in the review led in schools during the enrolment period, where 65% of the Grade 7 students have their owned cellular phones, tablets, and desktop computers, not to mention the gadgets owned by their parents and siblings.

Taking the above statements, the researcher claimed that students at present have changed radically. Today's learners are no longer the people our educational scheme was designed to teach decades ago. Hence, restructuring the manner teachers teach students for optimum learning is a need.

Banking on the positive effect of this multimedia network technology, the researcher is pushed to develop an Electronic Instructional Module that matches the above-mentioned purpose, which eventually serves as a great instrument in improving the academic performance of Grade 7 students in Science at Salapungan National High School which is far from the Schools' Division target (75%). Based on the available data, the average Mean Percentage Score (MPS) of Science for three consecutive school years (S.Y. 2016-2019) is only 65.49 and for the first quarter of the S.Y. 2019-2020, only 68.69 MPS was registered for Science 7.

In line with this underlying truth, the researcher finds it alarming and wants to immediately attend to this concern.

Electronic Instructional Module is an offline tool in discussing Science concepts using Kotobee Author as the main platform. Book Widgets, Vexel Art, MS Office and other computer software will also be used in structuring the lessons. Lessons were crafted using the Inquiry-based and Interdisciplinary Contextualization approaches.

The urgency to develop such instructional material was magnified by the current COVID-19 pandemic Filipinos are facing now. When the first case of COVID-19 was logged in the Philippines, The president, His Excellency Rodrigo R. Duterte with the recommendation of the Interagency Task Force (IATF) for COVID-19, the country was immediately placed under national health emergency. To prevent spreading of the novel corona virus, several precautionary steps were imposed like the avoidance of populated assemblies which resulted to the closing of business establishments, factories and mass transportations, limited mobility of people, social distancing, and preventive practices like hand washing and wearing of masks and face shields, among others.

Modular Instruction is type of instruction where the learners work through self-paced instructional materials (Loza, 2011). This is one of the most often used and widely recognized teaching-learning techniques in different countries including Asian countries and in other continents as well. Furthermore, Loza (2011) defines a module a piece of programmed instruction constructed in such a way as to facilitate the most efficient method of a user to acquire a new body of knowledge, learn a new skill or to be challenged on existing attitudes.

Moreover, Balderas (2012) specified in his study that modular way of teaching has progressed as solely dependent in printers to online modular instruction as an incipient way to learning.

Malik (2012), in his study claims that the experimental group (modular approach) is significantly better than control group (control group) in terms of performance. A difference of mean scores in teacher-made achievement test

where students in the experimental group i.e., the modular approach than the control group was recorded. The study indicated that the modular teaching approach had a better impact on students' comprehension of the text as compared to the traditional approach.

In Roman (2016), the module prepared by the proponent garnered a very high validity in objectives, language used, content, and evaluation. The module leads students in attaining a very satisfactory performance.

Rivera et al. (2018) use module in the Alternative Delivery Mode conducted at Santissimo Rosario High School as reflected in the study entitled, "Lived experiences of Alternative Delivery Modes Students (Modified 0ff-School). The study revealed that poor academic performance, unwanted pregnancies, high cases of working students, habitual absenteeism and other various life circumstances did not hinder learners to continue their studies.

Education is one of the greatly affected sectors in today's pandemic. The so-called "new normal" education was born this year. Tumapon (2020) used the definition taken from the Oxford Dictionary of 'new normal," as "a popular word or phrase used to summarize a specific concept." This previously unfamiliar word has become the standard process, the usual situation, and the expected outcome which brought drastic changes in the teaching-learning set-ups. The school year's calendar, students' arrangement in learning, the modalities in teaching and other administrative and clerical functions were also affected by this pandemic.

In SDO Pampanga, modular distance modality, specifically printed modular modality and TV/Video-based Instruction were used. The printed modules are made by subject teachers selected by the Division. The modules are structured as a Self-Learning Modules/Self Learning Kits (SLM/SLK) and Alternative Delivery Mode Module (ADM) and Modified Strategic Intervention Material (MSIM) which are found to be less interactive as compared to using an E-Module.

The research in some way may solve other issues of the teaching-learning process at present since face-to-face teaching is at risk. The development of an Offline Electronic Instructional Module will be a great supplement in an Alternative Delivery Mode which is in need today.

The module supports the flexible learning philosophy and curricular programs mandated by the Department of Education as stipulated in the MEMORANDUM DM-CI-2020-00162 (SUGGESTED STRATEGIES IN IMPLEMENTING DISTANCE LEARNING DELIVERY MODALITIES (DLDM) FOR SCHOOL YEAR 2020-2021). The E-Module in Matter is a Digital Modular Learning Modality, one of the learning modalities under Distance Learning platform.

The E-Module is crafted similar to a Self-Learning Modules (SLMs) with objectives that are based on the MELCs issued by DepEd. It is founded for the conversion of various content formats such as PDFs, educational audios, and videos, interactive powerpoints and others.

The Kotobee authored-E-Module can be published on students' cell phones, tablets, and similar gadgets to make the access a lot easier for them without going after to the printed modules. Using this E-Module will lessen the burden of module printing like the time and effort in printing, sorting, stapling the printed outputs, distributing it to the parents, checking and analyzing the answers and returning it back to the students afterwards. The cost and expenses attributed to printing of the modules will also be reduced.

The technical elements incorporated in the authoring tool include images and graphics derived using Vexel Art, video clips and animations produced and edited using MS Office and other video editing software, interactive activities, and quizzes.

When technology is rightfully incorporated in instructional devices, and with the accurate and appropriate delivery of teachers, the success of the students today as additional potential for workforce is secured regardless of any unexpected situations like the COVID-19 pandemic. Thus, Education is creating the "Most Essential Learners"-competent students equipped with knowledge for the "new normal."

2. RESEARCH QUESTIONS

This study was focused to develop an Electronic Instructional Module in Matter.

Specifically, it has achieved the following research objectives:

1. To design and develop an Electronic Instructional Module and Teachers Guide in Matter.
2. To evaluate the Electronic Instructional Module in Matter by the science teachers, and science experts in terms of:
    - 2.1. Content quality;
    - 2.2. Instructional quality;
    - 2.3. Technical quality; and
    - 2.4. Other findings.
3. To evaluate the Electronic Instructional Module in Matter by the IT experts in terms of technical quality.
4. To evaluate the educational qualities of the Electronic Instructional Module in Matter by the students, science teachers, and science experts in terms of.
    - 4.1. Integrity;
    - 4.2. Learner Focus;
    - 4.3. Usability; and
    - 4.4. Accessibility.

3. MATERIALS AND METHODS

The study is a developmental type of research. It used the Research and Development Design (Esquivel, 2012). The researcher developed and had the Electronic Instructional Module in Matter evaluated by the students, Science Teachers, Science Experts, and IT Experts.

The Research and Development method followed the following steps: Step 1-Planning; Step 2- Developing the preliminary draft of the Electronic Instructional Module; Step 3- Evaluation by the respondents; Step 4- Feedback; Step 5- Revisions; and Step 6- Finalization of the Electronic Instructional Module. The study was conducted in public junior high schools in Cluster V.

Purposive sampling was employed in choosing the student-respondents to evaluate the material. Purposive sampling is a sampling technique in which researcher relies on his or her own judgment when choosing members of the population (Black, 2010). The researcher purposively chosen those student-respondents with available gadgets to use; smart phones, tablets, laptops, or desktop computers, either personally owned or to his/her parents or siblings.

A total enumeration of 30 Science Teachers in Junior High School and 10 Science Experts were the respondents of this study who evaluated the material in terms of Content Quality, Instructional Quality, Technical Quality, Other Findings, and Educational Soundness. The 74 Grade 7 students of Salapungan National High were also included as evaluators of Educational Soundness of the material. Five (5) IT Experts were also included as evaluators of the technical quality of the material.

Two instruments were used in this study. These were adapted from Department of Education (DepEd) Learning Resources Management and Development System (LRMDS). The first was the Evaluation Rating Sheet for Non-Print Materials which was used to evaluate educational materials in non-print forms such as Google sites, Web pages, course wares and other DepEd related non-print articles. Evaluation Rating Sheets for Non-Print Materials were used to evaluate the quality of the developed lessons consisting of 37 items divided into four evaluation criteria namely: content quality, instructional quality, technical quality, and other findings.

To establish the validity of the instruments, the face and content validity were employed. The instrument for the evaluation of the developed lesson in Matter in terms of content quality, instructional quality, technical quality, integrity, learner focus, accessibility, and usability have four response options in four-point Likert Scale namely: (4) as very satisfactory; (3) as satisfactory; (2) as poor; and (1) not satisfactory. The criterion has other findings and has also four response options in four-point Likert scale namely: (4) not present/very satisfactory; (3) present but very minor and must be fixed/satisfactory; (2) present and require major redevelopment/poor; and (1) do not evaluate further/not satisfactory.

The study followed the design and development stage, and evaluation stage. In the development of the learning module, the researcher used the following processes of the Research and Development procedures. Step 1- Pre-Planning; The researcher read different books, modules, journals, and unpublished materials to collect relevant information on the content of the electronic instructional modules. Step 2- Planning; after reading all the related literature, the development was moved to planning stage in the Research and Development cycle. At this stage, the researcher solicited the help of Schools Division Office Personnel for the list of the most essential learning competencies which became the bases in crafting the lessons used in the Electronic Module. The objectives of the lessons that were developed were anchored on the competencies written in the Grade 7 Science Curriculum Guide**.** Step 3**-** Developing the Form; The lessons in the Electronic Module only covered the topics from the first quarter: Unit 1 Diversity of Materials in the Environment; Module 1 Solutions, Module 2 Substances and Mixtures, Module 3 Acids and Bases, Module 4 Elements and Compounds, and Module 5 Metals and Non-metals. Inquiry-based and Interdisciplinary and Contextualization approaches were the frameworks of the lessons. The Elements of the Electronic Module were composed of the different elements such as graphics, video clips, animations, interactive activities, and quizzes to enhance the learning of the students in Science 7 – Matter: (1) File Formats for Video Clips, graphics, images, and animation: (a) Video clips – in MP4 file format (b) Graphics and images – all images were in JPEG and PNG file format. (c) Animations – all animations included are in GIF file format.

In the Development Stage of the Electronic Instructional Module, the following hardware and software are required: desktop computer or Laptop, Kotobee Author, Kotobee Reader, Book Widgets, Vexel Art, Bitmoji, and Auto Desk Sketchbook, video editing software, and MS Office applications. The Kotobee Author, Kotobee Reader, and Book Widgets used in this study were the free-licensed versions of the software.In the evaluation phase, the results of the reviews of the material by IT experts, Science Teachers, Science Experts, and students were collected and formulated to come up with the revised material.

The weighted mean was used to describe the results of evaluation of students, Science Teachers, Science Experts, and IT Experts as to the content quality, instructional quality, technical quality, integrity, learner focus, usability, accessibility, integrity, learner focus, usability, and accessibility.

4. RESULTS AND DISCUSSIONS

1. Design and Development of the Electronic Instructional Module in Matter

The development of the Electronic Instructional Module in Matter adopted the Research and Development design of Esquivel, 2012.

The Gantt chart of activities was formulated also as guide of the researcher. The different stages of development commenced in May 2020 and ended in January 2021.

Stage	May 2020	June 2020	July 2020	Aug 2020	Sept 2020	Oct 2020	Nov 2020	Dec 2020	Jan 2021
Design and Development Stage									
Evaluation Stage									

Figure 4. Gantt chart of Activities

Design and Development Stage. During this stage, the learning contents in Grade 7 Science curriculum as prescribed by the Department of Education (DepEd) were examined. The competencies utilized were the Most Essential Learning Competencies (MELCs) in Quarter 1 as mandated also by the department. The changes on the use of the Most Essential Learning Competencies (MELCs) as basis in crafting the E-Module was based on the DepEd Learning Continuity Plan (LCP) had arised because of the COVID-19 pandemic.

The lessons in the Electronic Instructional Module covered the topics from the first quarter: Unit 1 Science Investigation; Module 1 Science Investigation and Matter; Module 1 Solutions, Module 2 Substances and Mixtures, Module 3 Elements and Compounds, Module 4 Acids and Bases, and Module 5 Metals and Non-metals. Inquiry-based and Interdisciplinary and Contextualization approaches were the framework of the lessons.

Kotobee Author is the main authoring tool used in the development of the lessons. The Kotobee author is a comprehensive E-Book creator and EPUB editor, suitable for education, training, and publishing. *Vijua* is Kotobee Author's publisher.

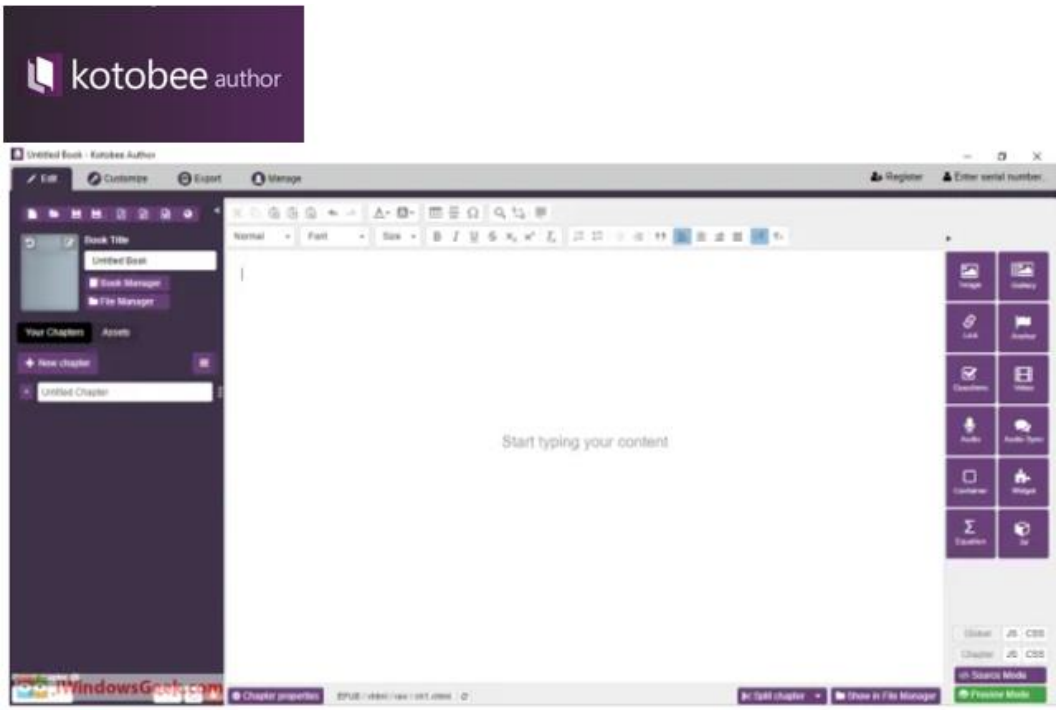

Figure 5. Kotobee Author

The technical elements incorporated in the authoring tool include Book Widgets for interactive activities, images and graphics derived using Adobe Photoshop, Vexel Art, and Bitmoji, video clips and animations produced and edited using MS Office applications and other video editing software, to enhance the learning of the students in Science 7 – Matter.

The developed E-Module could be published in any device available to the students such as smart phones, tablets, laptops, and desktop computers provided that a Kotobee Reader was installed. It could be used offline after the students had downloaded it.

The template design of the E-Module followed the Alternative Delivery Mode (ADM) Module recommended by the Department of Education with the following parts:

What I Need to Know. This part shows what to learn in the module. It contains learning objectives to be developed in a material. It introduces the topic/content of the module briefly.

What I Know. This is given to check what a student already knew about the lesson to be taken. This shall contain instruction whether to proceed or skip the module: If a student answered the pre-test 100% correctly, he/she may skip the lesson. If NOT, they must proceed with the lesson.

What's In. It connects the current lesson with the previous lesson by going over concepts that were learned previously.

What's New. Introduces the new lesson through a story, an activity, a poem, song, situation, or an activity.

What is It. In this section, the student was given a short discussion of the lesson. It aims to help him/her learn the new concepts and skills.

What's More. It is composed of activities to strengthen student's understanding and skills in the topic. It could be a guided/controlled practice, guided/controlled assessment, independent practice, or an independent assessment.

What I Have Learned. A question or fill in the blank sentence/paragraph to process what the learner learned from the lesson.

What I Can Do. An activity that shall transfer the skills/knowledge gained or learned into real-life concerns/situations.

Assessment. This evaluates the learner's level of mastery in achieving the learning objectives. The task given shall validate the concepts and provide more opportunities to deepen the learning.

Additional Activities. Activities in any form that can increase the strength of the response and tend to induce repetitions of actions/learning.

Answer Key. The repository of all answers in the activities could be found here. The student can view the answers here after he/she has finished answering the whole module.

Reflection Card. Shows responses which help students analyze their learning achievement. The card helps students to think about the material they have learned, and they can give immediate feedback. A tool that can be used by teacher either to provide supplement or remediation to the student.

The following are the interface of the Kotobee Author E-Module:

Kotobee Author Screen. It shows the main working screen of the E-Module. It can be navigated using the scrollbar located at the left. Below are short cut keys for Chapter, Media, Search, and Setting.

Figure 6. Kotobee Author Screen

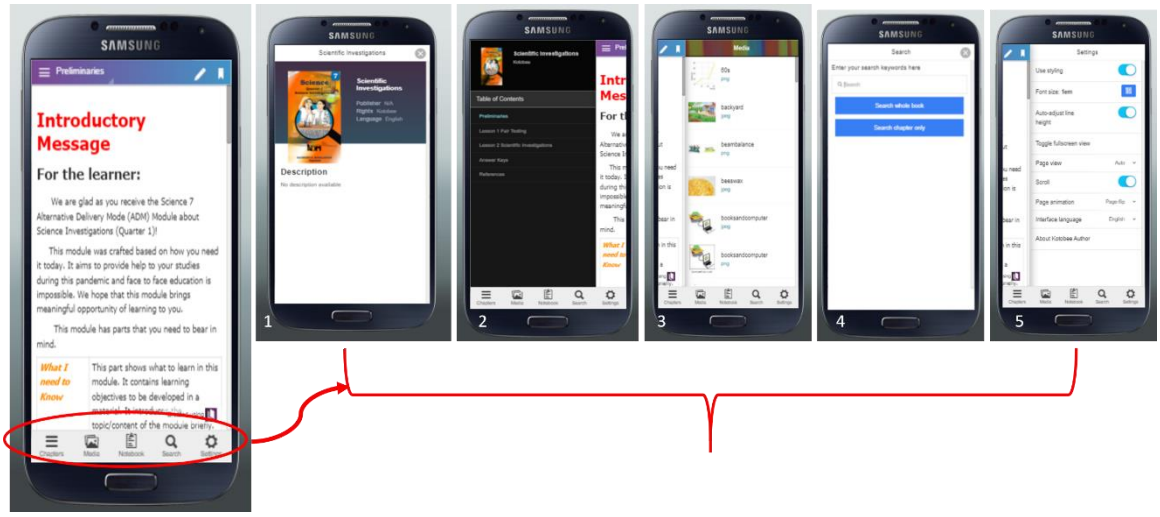

Figure 7. Parts of the Kotobee Author Screen

1. **Module Cover**. The part showing the name of the publisher, rights, and language.
2. **Chapter**. It shows the Table of Contents of the E-Module. The sequence of the lessons, answer key, and references are found here.
3. **Media**. The Media library is where the images, sounds, videos, and other animations are collected.
4. **Search**. If the student wanted to search an entire module in a group of E-Modules he/she may use "Search". He/she may also use this if he/she is looking for a chapter in an E-Module without opening the Table of Contents.
5. **Settings**. Student can navigate through this if wanting to change or wish to edit the current E-Module. The student may change the size, type, or color of the text, the color of the E-Module background, view, and animation of the E-Module. This works almost same with MS Windows offices, Word, Excel, and PowerPoint.

Submit Answers Option. It is used to submit answers and reveal the score once clicked. This could be used by the students to master a drill or exercise of a given topic. These answers the interactive, individualized, and reflective parts of the E-Module.

There are several reasons urging the development and use of updated and innovative pedagogical interactive technology in education according to Burkhanova, et al. (2012). Firstly, it is the need to implement a systemic activity, person-centered approach with a view to not just systematizing the actions of all participants in the learning process but also providing them with a personally significant direction in which to act (Individualized Learning). Secondly, the time has come to replace the rather tenuous way of passing along knowledge verbally with a more active means of learning (Interactive Learning). Thirdly, it has become crucial to be able to foresee the possible outcomes of the learning process, avoid negative consequences, and design a positive guaranteed result, (Reflective Learning), which requires a seamless technological chain of actions with proper forms, means, methods, and techniques in place underlying instructor and student interaction (Abykanova et al., 2016).

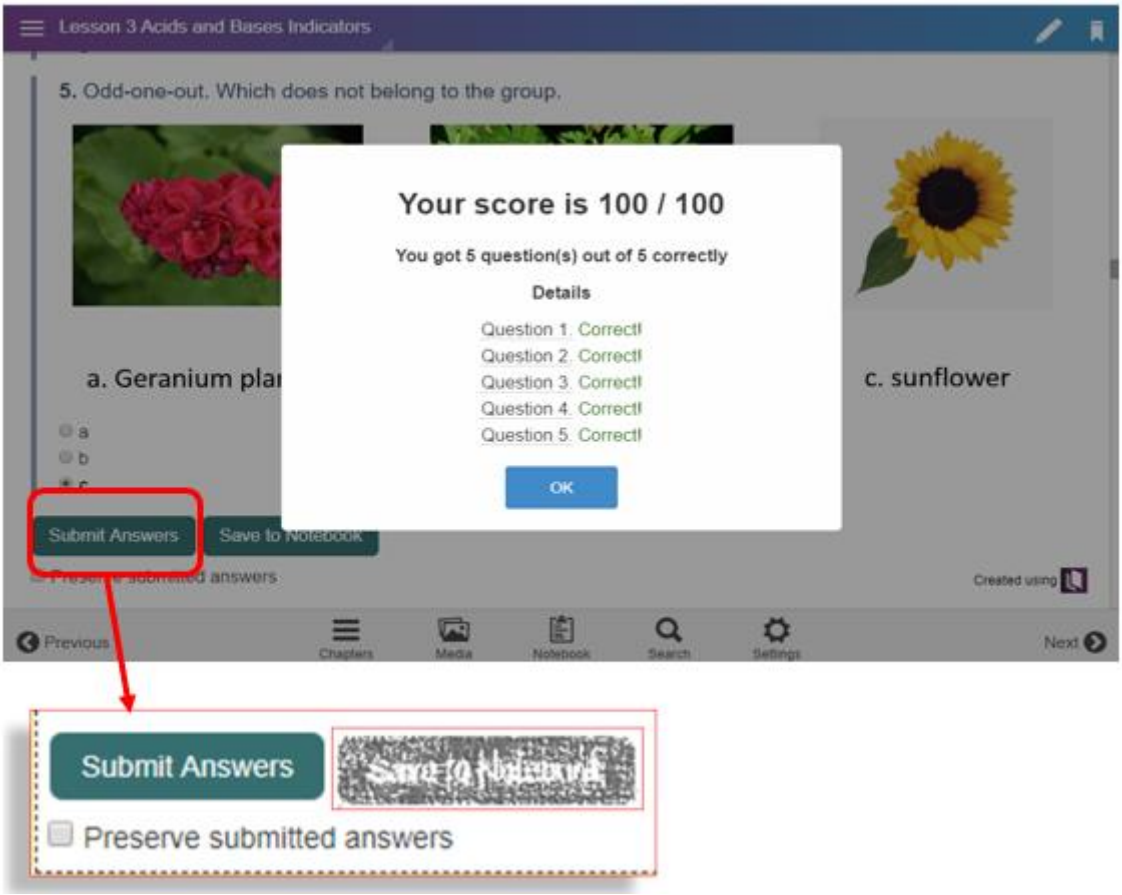

Figure 8. Submit Answers Option

Save to Notebook Option. It is used to save answers and eventually can be exported as a saved file ready to be sent to the teacher. This results to easier and faster compilation of students' work by the teacher. Hence, analysis and interpretation of the outcomes and possible remediation could easily be provided if needed.

The saved file can be reviewed "Notebook" part of the E-Module. This could be utilized as reference for future use. Once, "Preserve submitted answers," was clicked, it can no longer be edited.

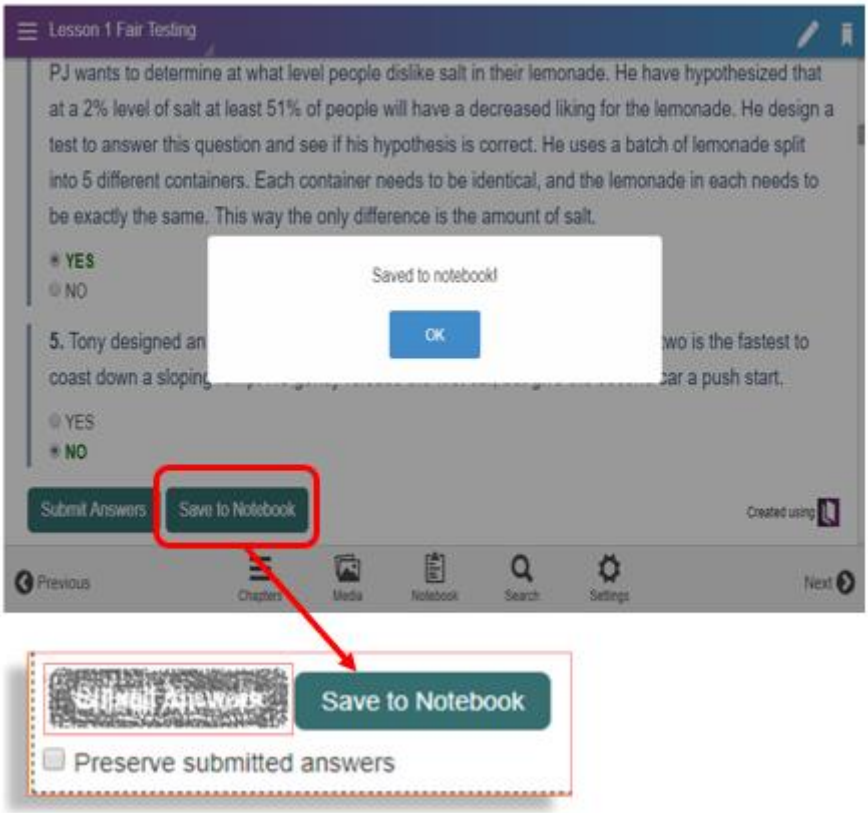

Figure 9. Save to Notebook Option

The proponent also designed added features of the E-Module to make it more interactive and appealing to the students.

Onsite Dictionary/Trivia. A pop-up message which gives the definition of unfamiliar word or provide an image or trivia regarding a word/phrase. This helps in the vocabulary building of the lesson associated with audio-visual learning.

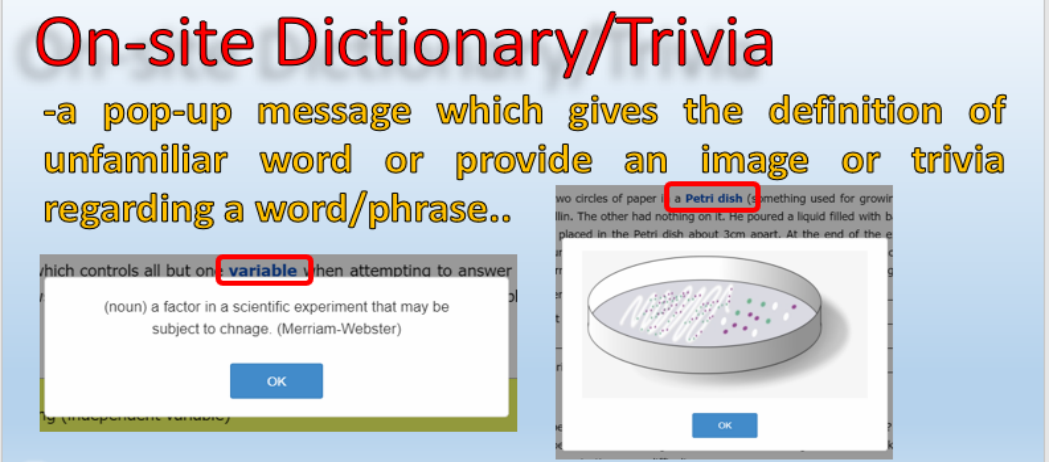

Figure 10. Save to Notebook Option

Audio Discussion. A recorded discussion of the topic. An aid for the textual lesson. A provision for PWD learners (sight impairment) or for struggling readers**.**

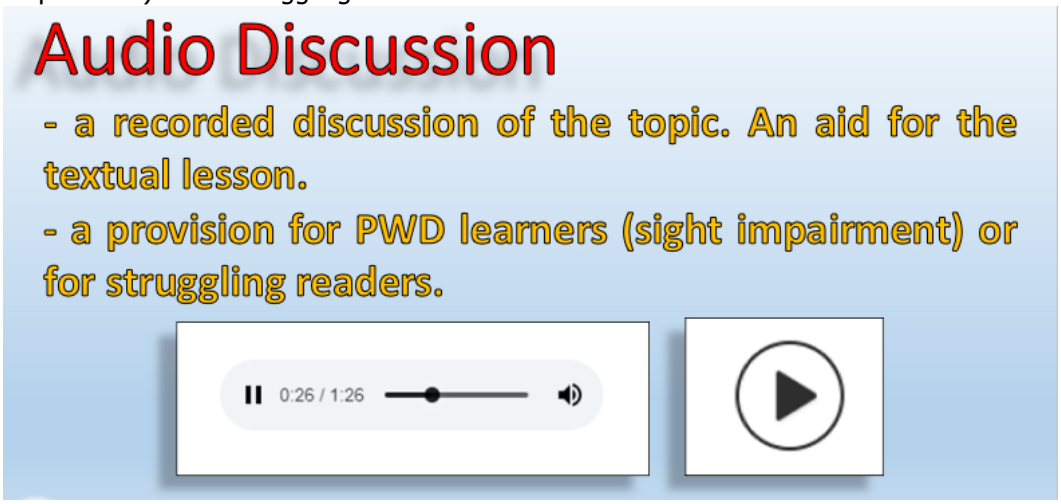

Figure 11. Audio Discussion

Video. A short video which discusses the topic, presents an experiment, or serves as an enrichment.

Figure 12. Video Discussion

Onsite Dictionary/Trivia, Audio Discussion, and Video Discussion constitute the audio-visual learning design of the E-Module.

Audio-visual aids are important in education system. Audio visual aids are those devices which are used in classrooms to encourage teaching-learning process and make it easier and interesting. Audio-visual aids are the best tool for making teaching effective and for the best dissemination of knowledge. So, there is no doubt that technical devices have greater impact and dynamic informative system (Saima et al., 2011)

Interactives. An interactive activity, simple game, or puzzle used to introduce the concept/topic or serves as enrichment made through Book Widgets. Book Widgets allows teachers to create a different type of interactive content. There are 40 different widgets people can use that can be linked to the E-Module. The Electronic Instructional Module in Matter used flash cards, memory games, image viewer and puzzles.

Figure 13. Interactives

2. Evaluation of the Electronic Instructional Module by the Science Teachers, and Science Experts

After the first draft of the E-Module had been prepared, it was subjected to evaluation. Through E-mails and FB Messenger, the copy of the E-Module was sent to the respondent-evaluators; 30 Science Teachers, 10 Science Experts, 5 IT Experts and 74 students. Likewise, evaluators rated the E-Module using the evaluation rating sheet converted in Google Sheet format sent via the same platforms. The proponent conducted no face-to-face dealings with any of the E-Module evaluators following the strict Inter-agency Task Force (IATF) health protocols. Results of the survey were monitored by the proponent as they were automatically sent to his E-mail. The downloaded results were sent to the statistician for analysis. The final draft of the E-Module was constructed incorporating the comments and suggestions of the evaluators.

Table 2.
Mean and Standard Deviation of Science Teachers' Evaluation of the Electronic Instructional Module

Evaluation Rating Sheet for Non- Print Materials	Inventory Score			
	N	M	VD	SD
A. Content Quality	30	3.93	VS	0.18
B. Instructional Quality	30	3.87	VS	0.23
C. Technical Quality	30	3.81	VS	0.24
D. Other Findings (Errors)	30	4.00	VS	0.00
Overall Mean		3.90	VS	

Legend:	**Rating Scale**	**Verbal Description**
	3.25 - 4.00	Very Satisfactory (VS)
	2.50 - 3.24	Satisfactory (S)
	1.75 - 2.49	Poor (P)
	1.00 - 1.74	Not Satisfactory (NS)

Table 2 presents the Mean and Standard Deviation of Science Teachers' Evaluation of the Electronic Instructional Module in Matter. Based on the evaluation of the 30 Science Teachers, it can be gleaned that Factor D, "Other Findings" (conceptual, factual, grammatical, and other errors) received the highest mean (M=4.00, SD=.00) and was verbally interpreted as "Very Satisfactory." Factor A, "Content Quality" registered a mean of 3.93 with a standard deviation of 0.18 and was verbally described as "Very Satisfactory." Factor B, "Instructional Quality" generated a mean of 3.87, a standard deviation of 0.23, and having a verbal interpretation of "Very Satisfactory." Lastly, Factor C, "Technical Quality" marked the lowest mean (M=3.81, SD=0.24) and was verbally described as "Very Satisfactory."

The overall mean was computed at 3.90 which was verbally described as "Very Satisfactory."

All factors received a verbal interpretation of "Very Satisfactory." This means that Science Teachers unanimously evaluated the E-Module with high or very satisfactory remarks.

The table also revealed that Factor D, "Other Findings" (conceptual, factual, grammatical, and other errors) further support that there were no serious errors found in the E-Module. The absence of these errors leads to the "Very Satisfactory" rating of the E-Module.

The E-Module ensured that the presentation of content would not lead to misconceptions or misunderstandings. Factual contents included in the resource are also accurate and updated. It also safeguarded that outdated information, improper use of statistics or computational errors, inaccurate graphs, erroneous visuals, and over simplified models were not present.

This is in line with the objective of DepEd Learning Resource Management and Development System (LRMDS) to identify the level of access to quality learning resources in every Schools Division. The agency as well provide technical assistance for assessing, acquiring, adapting, developing, producing, and distributing quality learning and teaching resource materials for students and instructional support materials for teachers.

The Department of Education (DepEd) received reports on the errors found in the learning modules used during the opening week of S.Y. 2020-2021 (Adonis, 2020). The Department has identified 30 errors in the self-learning modules (SLM) used during the first quarter of the Distance Learning platform (Magsambol, 2020). After verification, 20 errors are factual errors, 7 are computational errors, and the 3 remaining errors are on format and printing only. In line with these, DepEd has set up a monitoring program to investigate complaints of errors in the learning modules. Error Watch is a solution DepEd has provided to respond immediately to module errors.

Factor C, "Technical Quality" received a verbal interpretation of "Very Satisfactory." This implies that Science teachers found the E-Module with sound technical characteristics. The visuals, audios, and videos had complete synchronization which help to enhance understanding of the concept. Screen displays are not cluttered, easy to read, and aesthetically pleasing to sustain interest to the users.

Tasir (2015), in his study entitled "*Self-Instructional Teaching Module based on Cognitive Load Theory: A Study on Information Retention among Trainee Teachers*," stated that an instructional module consists of two media namely, text and visuals that complement each other. These multiple representations resulted in a more complete representation of an application domain than a single source of information does. The expected results revealed that the cognitively guided module which physically integrate text and visuals showed to be far superior as a learning tool than to a conventional instruction.

The E-Module was user-friendly. The design allowed the target user to navigate freely through the material. The material could easily and independently be used. The material will run using minimum system requirements.

Stockwell et al. (2015), Febrianti et al. (2017) and Kumar (2013) found results similar to the present study. Based on the results of Stockwell et al. (2015), the development of digital module stimulates students to learn independently and find physics concepts as challenging and students feel happy while learning physics. This independency acquired by students while using E-Module is also supported by the study of Febrianti et al. (2017) which showed that the developed physics digital modules are suitable for use as self-learning materials for students. Kumar (2014) also added that using E-Module provided conveniency to the users aside from being independent learners.

Researchers like Glassman (2012) and Balmeo et al. (2014) focused on the integration of technologies with special learning needs. Balmeo et al. (2014) applied their study in the SPED Schools in Baguio City. Glassman (2012) applied his research to the students with mild to moderate cognitive impairments. The same consideration on persons

with disability (PWD) was also reflected in the E-Module in Matter. The proponent used audio discussion along with the textual lesson as aide in learning.

Table 3.

Mean and Standard Deviation of Science Experts' Evaluation of the Electronic Instructional Module

Evaluation Rating Sheet for Non-Print Materials	Inventory Score			
	N	M	VD	SD
A. Content Quality	10	3.91	VS	0.11
B. Instructional Quality	10	3.84	VS	0.23
C. Technical Quality	10	3.79	VS	0.23
D. Other Findings (Errors)	10	4.00	VS	0.00
Overall Mean		3.89	VS	

Legend:	**Rating Scale**	**Verbal Description**
	3.25 - 4.00	Very Satisfactory (VS)
	2.50 - 3.24	Satisfactory (S)
	1.75 - 2.49	Poor (P)
	1.00 - 1.74	Not Satisfactory (NS)

Table 3 presents the Mean and Standard Deviation of Science Experts' Evaluation of the Electronic Instructional Module in Matter. Based on the evaluation of the 10 Science Experts, it can be noticed that Factor D, "Other Findings" (conceptual, factual, grammatical, and other errors) received the highest mean (M=4.00, SD=.00) and was verbally interpreted as "Very Satisfactory." Factor A, "Content Quality" registered a mean of 3.91 with a standard deviation of 0.11 and was verbally described as "Very Satisfactory." Factor B, "Instructional Quality" generated a mean of 3.84, a standard deviation 0f 0.23, and a verbal interpretation of "Very Satisfactory." Lastly, Factor C, "Technical Quality" marked the lowest mean (M=3.79, SD=0.23) and was verbally described as "Very Satisfactory."

The overall mean was registered at 3.89 which was verbally interpreted as "Very Satisfactory."

Findings on the table revealed the evaluation of the 10 Science Experts on the Electronic Instructional Module in Matter. The same results from the Science teacher-respondents were generated. Science Experts in unison found no serious errors on concepts, facts, grammar, typographical, and computation. Contents and facts were presented accurately with updated information, proper use of statistics and computations. Paragraphs were checked to avoid grammatically misused words and incorrectly written spelling. The absence of these errors (conceptual, factual, and grammatical) adds up to the reliability of the E-Module as an effective learning material.

Adonis (2020), in his article in INQUIRER.NET wrote that the Department of Education (DepEd) Undersecretary Diosdado San Antonio acknowledged the errors in some Self-Learning Modules published by the Department and promised to take immediate actions on them.

San Antonio added, "Content errors found inappropriate shall be rectified via an issuance from the concerned Regional Director if the SLM is used in the whole region (Malipot, 2020)"

Factor C, "Technical Quality" also received a "Very Satisfactory" mark from the Science Expert-evaluators. This in line with their inputs that the E-Module was equipped with technical components which supported maximum learning for the students. The said learning resource, according to them had vocabulary development support. The amount of text on the screen was limited to avoid continuous scrolling which made reading easy. Graphics and visuals were used to compliment textual information which attract attention, aid retention, and enhance understanding. Videos and sound effects were used effectively. The design was contextualized so the target users could work independently on it.

According to Elly (2010), simply providing resources is not enough. He suggested that placing interesting audio-visual materials is necessary to improve academic performance. In addition, he encouraged teachers to make sure that students interact in the process, not just being passive recipients of information. This could be done if the technical quality of a resource is highly remarkable.

Thorton (2010), in his study, supported the above claim. He stated that the use of computer modelling is an efficient method since it allows students to construct a theoretical model of the real phenomena in the world of science. Thus, modelling becomes an important tool which can be used in the scientific process of acquiring knowledge.

Christova (2011), Elayaraja et al. (2010), Tan et al. (2009) and the present study claimed the importance of the technical aspects embedded in an E-Module. Christova (2011), in his study, highlighted the significance of multimedia tools in the transfer of knowledge in a specific discipline. This importance solidified in the study of Elayaraja et al. (2010) and Tan et al. (2009) which both revealed that multimedia network technology is an integral part to improve the efficiency of teaching, to stimulate students' interest, to cultivate students' innovation capability, and to broaden the area of student learning. The E-Module in Matter, as the main feature in the present study utilized Book Widgets to add interactivity to the lessons and Vexel Art and Bitmoji to boost the visual effect of the images in the E-Module.

Furthermore, Heradio et al. (2016) and Triona et al. (2003) make their studies unique by using virtual laboratories to replace real laboratories in conducting scientific experiments. These virtual laboratories were used to simulate different scientific experiment scenarios which are impossible to perform in actual set-up. The E-Module in Matter on the other hand used videos to guide the students in doing the prescribed activities.

These clearly illustrate the impressive evolution of digital teaching from using a simple MS Office software like MS PowerPoint in lesson presentations (Davis et al. (2014), to video lessons using various video editing tools and to a more complicated designs of E-Module and courseware. These also demonstrate the competition in the development of teaching devices from being an online platform to an offline and user-friendly teaching instruments.

Table 4.
Science Teachers' and Science Experts' Rating Evaluation of the Electronic Instructional Module in Matter

Evaluation Rating Sheet for Non- Print Materials	Science Teachers (N=30)	Science Experts (N=10)
A. Content Quality	Passed	Passed
B. Instructional Quality	Passed	Passed
C. Technical Quality	Passed	Passed
D. Other Findings (Errors)	Passed	Passed

Legend:

Content Quality (Resource must score at least 30 points out of 40 points)	Passed
Instructional Quality (Resource must score at least 30 points out of 40 points)	Passed
Technical Quality (Resource must score at least 49 points out of 52 points)	Passed
Other Findings (Resource must score at least 16 points out of 16 points)	Passed

Table 4 provides a description of the Science Teachers' and Science Experts' Rating Evaluation of the Electronic Instructional Module in Matter. The table shows that all factors were marked "Passed" both on the evaluations of the Science teachers and Science Experts. This means that the E-Module scored at least 30 points out of 40 points in the "Content Quality;" at least 30 points out of 40 points in the "Instructional Quality;" at least 49 points out of 52 points in the "Technical Quality;" and 16 points out of the 16 points in the "Other Findings" (conceptual, factual, grammatical, and other errors) factor.

Further perusal to the table, the "Passed" mark of all the evaluators signified their approval that: (a) the E-Module was consistent with topics / skills found in the DepED Learning Competencies for the subject and grade level it was intended and the ability of the instrument to contribute to enrichment, reinforcement, or mastery of the identified learning objectives; (b) the purpose of the material was well-defined and objectives are clearly stated and appropriate level of difficulty is appropriate for the intended target user by providing enjoyable, stimulating, challenging, engaging activities; (c) that all visuals, audios, and videos used are aesthetically pleasing, accurate, helped to understand the concept and effective for instructional purposes; and (d) it was free from conceptual, factual, grammatical and other errors.

As time goes by, continuous development of the educational system becomes necessary. It is always true that there is no educational system and teaching methods that suit for all types of learners. Luckily, teachers have realized that the existing instructional methods can no longer meet the demands of modern technology. Thus, there is a need to adapt educational innovations. Hence, educational objectives were set and supporting guiding policies were promulgated. These educational policies were designed to improve teaching methodologies and techniques geared towards the attainment of the optimum potential learner. Innovative and useful instructional tool and strategies will give much priority (Lacanilao, 2019).

The idea cited above by Lacanilao (2019) matters in this year's pandemic. The E-Module is needed to suit the needs and situation of the learners. The module was designed to meet the objective of DepEd to continue the good quality of education despite of COVID-19 threats. It is an innovation that can be a potential tool to Distance Learning.

The E-Module developed by Serevina et al. (2018) was rated "Very Good" by the Science Experts and Science Educators obtaining scores of 86.31% and 80.78%, respectively. This is same with the verbal descriptive rating attained by the E-Module of the present study.

In addition, the developed module by Roman (2016) also had very high extent of validity in terms of specific objectives, content, language used, and evaluation activities. The utilization of the developed module led students to have a very satisfactory performance that could be applied in the real-life situations and the language used were at the level of the students similar to the E-Module in Matter.

3. Evaluation of the Electronic Instructional Module in Matter by the IT Experts in terms of Technical Quality

Table 5.
Mean and Standard Deviation of IT Experts' Evaluation of the Electronic Instructional Module

Evaluation Rating Sheet for Non-Print Materials	Inventory Score			
	N	M	VD	SD
Technical Quality	5	3.77	VS	0.28

Legend: Rating Scale	Verbal Description
3.25 - 4.00	Very Satisfactory (VS)
2.50 - 3.24	Satisfactory (S)
1.75 - 2.49	Poor (P)
1.00 - 1.74	Not Satisfactory (NS)

Table 5 presents the Mean and Standard Deviation of IT Experts' Evaluation of the Electronic Instructional Module in Matter. Based on the evaluation of the five IT Experts, it can be noted that Technical Quality received a mean of (M=3.77, SD=.28) and was verbally interpreted as "Very Satisfactory."

IT Experts mentioned that aaudio was well-executed in the E-Module. Visuals were good. The materials are easy to use. Other IT Experts claimed that the E-Module exhibited the following: 1. Congruency to K 12 curriculum/accordance to MELCs; 2. The topics were discussed comprehensively; 3. Concepts have been accompanied by very engaging video and vibrant pictures; and 4. For the learner's level, the contents were relevant.

The utilization of instructional module improves the learner competencies and opportunities to master the subject. This is because a well-planned module teaches concepts in a logical order. In an educational module, learners' focus on specific skills and were given opportunities to continue improving on them. Unlike in traditional method, only the teacher has a book, and delivers the lesson in a conventional manner (Mayen, 2017).

A congruent study on heat and temperature (Serevina et al., 2018) entitled *"The Problem-based Learning E-Module,"* gained a percentage score of 75.78% from Media Experts which is verbally described as "Good." The present study also used problem-based learning encapsulated in the Inquiry-based Approach. But contrary to the above-mentioned study, the E-Module in matter was rated with the highest possible mark of "Very Satisfactory" by the IT Experts.

With similar instrument (Evaluation Rating Sheet for Non-Print Materials) used, the *"Development and Evaluation of Localized Digital Learning Modules for Indigenous Peoples' Health Education in the Philippines,"* authored by Tolentino et al. (2020) was accepted as an action research by the evaluators with "Very Satisfactory" rating. The lessons on personal health and hygiene taught among Aetas in Pampanga were also structured in a digital learning module same with the current study. Adobe Animate (previously known as Adobe Flash) was used as the authoring tool instead of Kotobee Author. Adobe Photoshop was also rendered to enhance the colors and depths of each element. The background scene, images, characters, and videos were tailored specifically for the indigenous people's locale to be more attractive, catchy, and reflective.

On the other hand, Wang (2017) advanced his study by using multimedia animation in designing examination questions and developing a Web-based Performance Assessment system (WPA system) to evaluate examinees' understanding of the procedure of scientific experiments. WPA system had improved students' understanding of the procedure of scientific experiments.

4. Evaluation on the Educational Qualities of the Electronic Instructional Module by the Science Teachers, Science Experts, and students.

Table 6.

Mean and Standard Deviation of Science Teachers' Evaluation of the Electronic Instructional Module on Educational Soundness

Educational Soundness General Evaluation Checklist	Inventory Score			
	N	M	VD	SD
A. Integrity	30	3.87	VS	0.21
B. Learner Focus	30	3.91	VS	0.12
C. Usability	30	3.91	VS	0.23
D. Accessibility	30	3.72	VS	0.29
Overall Mean		3.85	VS	

Legend: Rating Scale	Verbal Description
3.25 - 4.00	Very Satisfactory (VS)
2.50 - 3.24	Satisfactory (S)
1.75 - 2.49	Poor (P)
1.00 - 1.74	Not Satisfactory (NS)

The data collected on Table 7 present the Mean and Standard Deviation of Science Teachers' Evaluation of the Electronic Instructional Module in Matter on Educational Soundness. Based on the evaluation of the 30 Science Teachers, it can be noted that Factor B, "Learner Focus" and Factor C, "Usability" both received the highest mean (M=3.91), with a standard deviation of 0.12, and 0.23 respectively and with a verbal description of "Very Satisfactory." Factor A, "Integrity" scored a mean of 3.87 with a standard deviation of 0.21 and was verbally rated as "Very Satisfactory." Factor

D, "Accessibility" generated a mean of 3.72, a standard deviation 0f 0.29, and a verbal interpretation of "Very Satisfactory."

The overall mean was computed at 3.85 which was verbally described as "Very Satisfactory."

Factor B, "Learner Focus" garnered a verbal description of "Very Satisfactory." As evaluated by Science Teachers, the E-Module used content in ways that are authentic for learners. The examples were realistic, relevant, and made sense to the learners.

Armstrong (2012) emphasized in his study that when students are directly involved and invested in the discovery of their own knowledge, experiential learning becomes authentic, holistic, and challenging. Using the development of metacognitive process, students can reflect on their thinking centered on meaningful performances in real-world context. The proponent intentionally organized the lessons to cohesively assist students to make connections to key concepts.

Factor C, "Usability" also generated a verbal interpretation of "Very Satisfactory." This means that clear instructions were provided in the E-Module. The purpose, processes, and intended outcomes of the E-Module are also well-stated.

DepEd moved its part to reform educational system to produce students who are highly equipped with a quality education for their total holistic transformation (Andal, 2016).

Mendoza (2012) stated that with proper implementation, this approach could lead to increase motivation to learn, greater retention of knowledge, deeper understanding and more positive attitude toward the subject being taught.

Factor D, "Accessibility" recorded a verbal description of "Very Satisfactory." The resource may not require teacher/facilitator intervention to be used effectively in varied learning environments and learning sequences. But given with good feedback on this area, evaluators still suggested to include instructions, terms, and materials in languages understood by the learners as aid for explicit understanding.

Suba (2014) stated that, "Learning is not about passivity and order," it is about the messy process of discovery and construction of knowledge." Construction of knowledge for oneself leads to genuine learning and mastery. It aims to develop learner autonomy and independence by putting responsibility for the learning path in the hands of students. It focuses on skills and practices that enable lifelong learning and independent problem solving which is primarily based on the constructivist learning theory that emphasizes the learner's critical role in constructing meaning from new information and prior experience.

Teachers can still assist students to acquire a set of strategies, define goals, and monitor their progress (Darling-Hammond et al, 2008). Providing opportunities for students to reflect on what and how they learn creates an environment where students take responsibility for their learning and become more of a partner with their teacher's teaching in engaging in meaningful learning experience; an experience which the teacher facilitates but does not dominate.

The same approach with the present study, Istuningsih et al. (2018) required teacher as facilitator only in the teaching-learning process. The role of the teacher is to support the creation of active learning of the students by using a variety of media. One way to create such learning is to use an E-module media. Both studies utilized Inquiry-based Approach but differ on the design template used in formulating the lessons. The present study is templated using the Alternative Delivery Mode (ADM) Module while Istuningsih et al. (2018) E-Module was crafted using 7E's learning cycle.

Table 7.

Mean and Standard Deviation of Science Experts' Evaluation of the Electronic Instructional Module on Educational Soundness

Educational Soundness General Evaluation Checklist	Inventory Score			
	N	M	VD	SD
A. Integrity	10	3.87	VS	0.19
B. Learner Focus	10	3.90	VS	0.11
C. Usability	10	3.80	VS	0.32
D. Accessibility	10	3.54	VS	0.34
Overall Mean		3.78	VS	

Legend:	**Rating Scale**	**Verbal Description**
	3.25 - 4.00	Very Satisfactory (VS)
	2.50 - 3.24	Satisfactory (S)
	1.75 - 2.49	Poor (P)
	1.00 - 1.74	Not Satisfactory (NS)

Table 7 shows the results of the Mean and Standard Deviation of Science Experts' Evaluation of the Electronic Instructional Module in Matter on Educational Soundness. Based on the evaluation of the 10 Science Experts, it can be noticed that Factor B, "Learner Focus" registered the highest mean (M=3.90), with a standard deviation of 0.11, with a verbal interpretation of "Very Satisfactory." Meanwhile, Factor A, "Integrity" received a mean of 3.87 with a standard deviation of 0.19 and was verbally described as "Very Satisfactory." Factor C, "Usability" garnered a mean of 3.80, a standard deviation of 0.32, with a verbal interpretation of "Very Satisfactory." Finally, a mean of 3.54, standard deviation of 0.34, and a verbal description of "Very Satisfactory" were recorded for Factor D, "Accessibility."

The overall mean was registered at 3.85 which was verbally described as "Very Satisfactory."

Factor B, "Learner Focus" generated a verbal description of "Very Satisfactory." This means that all descriptors underlying this factor are satisfied as evaluated by the respondents. Evaluators commented that the learning objectives incorporated in the E-Module were made explicit to learners/users. The objectives were designed to the most essential competencies as learners need them today.

The researcher used "household-based learning," where the materials, procedures, and activities were used by a common household in a day-to-day basis. Furthermore, the researcher believed on the idea that learning is only achieved when applied and which does not only remain as theories. Hence, application of this in home set-up makes learning more authentic and meaningful.

Using the Alternative Delivery Mode (ADM) Module design, optimum learning was achieved because content is structured to scaffold learning and lessons were structured based on identified target users. Lessons are arranged in developing sequence so that learners can revisit one previous topic and relate it to the current. In addition, it also provides opportunity for learners to obtain feedback regarding each lesson using the Reflection part in the E-Module.

Factor D, "Accessibility" got a verbal interpretation of "Very Satisfactory." Science Experts agreed that the E-Module needs less facilitation from the teacher to be used effectively.

As a self-learning material, the ease in the use of the E-Module was considered. The use of each navigation tool (toolbars, Kotobee Author main screen parts, special features) was clearly explained. How to use Kotobee Authored E-Module step-by-step procedure was also attached to guide the users.

Mantaluk et al. (2012) concluded that the use of a teaching module contributed high level thinking skills among students. This module also enabled students to achieve better performance toward learning process.

However, there were several constraints faced by teachers and students while using this method. Since, it is a self-paced material, students tend to misuse their time when left alone or when the environment is not conducive for learning.

This is now the proper time for teachers to impose discipline among students. According to Papert (2012), the usual method of employing computer techniques in education is by using it as a tool. It can replace teaching aids but not the teacher himself for it remains imperative that the teacher guides the students in the process of acquiring information, working with the device, and applying knowledge for future use. Hence, the teacher remains a vital component in the teaching-learning process.

Table 8.

Mean and Standard Deviation of Students' Evaluation of the Electronic Instructional Module on Educational Soundness

Educational Soundness General Evaluation Checklist	Inventory Score			
	N	M	VD	SD
A. Integrity	74	3.72	VS	0.36
B. Learner Focus	74	3.69	VS	0.38
C. Usability	74	3.64	VS	0.41
D. Accessibility	74	3.46	VS	0.45
Overall Mean		3.62	VS	

Legend:	**Rating Scale**	**Verbal Description**
	3.25 - 4.00	Very Satisfactory (VS)
	2.50 - 3.24	Satisfactory (S)
	1.75 - 2.49	Poor (P)
	1.00 - 1.74	Not Satisfactory (NS)

Table 8 shows the Mean and Standard Deviation of Students' Evaluation of the Electronic Instructional Module in Matter on Educational Soundness. Based on the evaluation of the 74 students, it was revealed that Factor A, "Integrity" received the highest mean (M=3.72, SD=0.36), with a verbal description of "Very Satisfactory." It is followed by Factor B, "Learner Focus" scored a mean of 3.69 with a standard deviation of 0.38 and was verbally described as "Very Satisfactory." Factor C, "Usability" generated a mean of 3.64, a standard deviation of 0.41, and a verbal interpretation of "Very Satisfactory." On the other hand, Factor D, "Accessibility" recorded a mean of 3.46, standard deviation of 0.45, and was verbally interpreted as "Very Satisfactory."

The overall mean was computed at 3.62 which was verbally interpreted as "Very Satisfactory."

Factor A, "Integrity" garnered a verbal description of "Very Satisfactory." The E-Module used language and symbols of the content domain and its ways of representation support learners in developing and using them. The researcher gave value on representation as a way of learning. He believed that students learn better if he/she can perceive lessons in visuals rather than textual.

The result of Cordova et al. (2017) study revealed that the post-test of the experimental group is higher than the post-test of the control group. This is achieved by using MATHREETEC: Visual-Model-Pattern, which exposed the participants to visual representations in answering problem solving items. Meanwhile, Debalucos (2005) in her study entitled *"Development and Validation of Modules in Selected Topics in Clothing and Textile,"* found out that students were in favor of the modules as supplementary materials simply because of achieving higher performance rate.

The same result was recorded in an action research conducted by Manalastas (2014). He utilized cartoon-inspired selections in visual forms in teaching Grade 7 Science topics in Quarter 2. The experimental group who became exposed to cartoon-inspired selections in visual forms performed better than the control group.

Factor D, "Accessibility" got a verbal interpretation of "Very Satisfactory." Because of the user-friendly design of the E-Module, student-evaluators insisted the less intervention to be given by the teacher as teaching is concern. Teachers would step only if untoward incidents on the use of the E-Module occur. The need of facilitator will be evident also in interpreting the results of students' assessment for additional tasks as sorts of remediation. Other than that, the E-Module would be used by the target user on his own with ease.

Bleimann (2004) stated that "e-learning is a self-directed learning based on web-based technology and provides autonomy to learn." These factors presented by Bleimann (2004) were both components of the E-Module in Matter. In contrast, the latter is crafted as an offline E-Module using Kotobee Author while the former is designed as an online E-Module.

Mayotte et al. (2013) stated that the future of the next generation to manage their affairs depended to a great extent on the capability of the education system to train students the proper attitude, values, and skills that would make them successful and happy individuals, good citizens, and productive members of the society.

Equipping students with knowledge that they can apply outside would be beneficial to them. If students have some control over their learning, they will more likely learn for themselves rather than just learn from the teacher (Adriano, 2011).

This is also supported by Li et al. (2018). The results of their study showed that interactive materials significantly affect the relationship between motivation for better assessment and learning satisfaction as well as the relationship between internal motivation and learning satisfaction. These results were complemented by qualitative analysis including interviews and focus group discussions with teachers.

Furthermore, interactive materials positively affected not only the students but also the teachers. Teachers conducting self-development with interactive learning materials were highly motivated to achieve better teacher assessment. Teachers with interactive learning materials had higher learning satisfaction.

Table 9.

Percentages of the Recommendation of Science Teachers, Science Experts and Students on the Electronic Instructional Module in Matter

Educational Soundness General Evaluation Checklist			
	Science Teachers (N=30)	Science Experts (N=10)	Students (N=74)
Recommend reproduction and distribution in current format. Resource acceptable as is.	80.00	60.00	68.91
Resource requires modification before being reproduced.	20.00	40.00	31.08

Percentages of the Recommendation of Science Teachers, Science Experts and Students on the Electronic Instructional Module in Matter is presented in Table 9. As can be seen from the mentioned table, 80% from the 30 Science Teacher-evaluators recommended the reproduction and distribution of the E-Module in current format and only 20% require modification of the resource before reproducing. It can also be noted that 60% of the 10 Science Expert-evaluators recommended the reproduction and distribution of the E-Module in current format and the remaining 40% require modification of the resource before reproduction. Lastly, for the student-evaluators, the E-Module was recommended to be reproduced and distributed as it is by the 68.91% of the respondents while the 31.08% out of the 74 student-evaluators require modification of the resource before reproducing it.

Some minimal recommendations of the respondent-evaluators regarding the initial draft of the E-Module pertain to the technical, structural, and ethical considerations parts of the resource. Some Science Teachers and Science Experts

suggested to consider revising some questions on "What I Need to Know" and "Assessment" parts to be aligned on the MELCs. They also suggested the merging of some related competencies. Some IT experts' minor recommendations deal on some technical problems on audio and videos used. Also, the use of "Hangman", a type of Book Widgets, is recommended to be removed as it is not a friendly tool in learning and connotes a negative feedback. Some student-evaluators find very few activities to be difficult hence, revisions were recommended. Directions should be written in dialect or simple language understood by most of the students was also suggested. After receiving all the above-mentioned recommendations from the evaluators, the proponent immediately considered revisions of the E-Module. Reflection Card was also added as part of the E-Module which is not present in the initial draft.

The study of Nwike (2013) showed that students taught with instructional materials performed better than those taught without instructional materials. The null hypothesis tested at 0.05 level of significance indicated that there is significant difference between the achievement scores of those taught with instructional materials and those taught without instructional materials. It was therefore recommended that instructional materials be used in teaching students in secondary schools because they have positive effect on students' performance.

This is seconded by Pinto (2007) by mentioning the advantages of using such teaching aide which include quality performance objectives, self-pacing, and frequent feedback. The principles and purposes of modular instructions (MI), the advantages for both students and instructor and a comparison between the conventional and modular approach are also presented in his study.

5. CONCLUSIONS

From the findings of the study, the following conclusions were drawn.

1. The development of the E-Module is systematic because it followed a model of instructional material development. The Electronic Instructional Module in Matter is Kotobee Author-based and Alternative Delivery Mode-designed (ADM) Module. It also offers new method of teaching-learning process in the Distance Learning Delivery Modality.
2. The content quality, instructional quality, technical quality, and other findings about the E-Module were rated by the Science Teachers and Science Experts with "Very Satisfactory" remark. This indicates that all descriptors under each factor in the evaluation of the E-Module were successfully met and satisfied.
3. The E-Module in terms of technical qualities have passed the evaluation check of the IT Experts with a verbal description of "Very Satisfactory." This means that the E-Module is technically sound and pleasing.
4. The educational qualities of the E-Module in terms of integrity, learner focus, usability and accessibility received a "Very Satisfactory" rating from the Science Teachers, Science Experts, and students. This implies that the developed E-Module possessed high educational qualities.
5. Majority of the Science teachers, Science Experts and student-respondents recommended the reproduction and distribution of the E-Module in current format. This indicates that the E-Module is holistically ready for use in public schools.

6. RECOMMENDATIONS

In view of the findings of the study and the conclusions drawn, the following recommendations are offered.

1. To subject the E-Module for further evaluation of the DepEd Central Office Material Resource Evaluation Team strictly for following the standard phases of evaluation.
2. To check the quality of the E-Module when integrated in online learning platforms like the Learning Management System, Edmodo or Google Classroom commonly used in Blended Learning Modality or when the E-Module is exported as a web, mobile or desktop app.
3. To assess the technical aspect and compatibility of the E-Module in IOS types of smart phones, or other higher versions.
4. To evaluate the crafted E-Module using the premium version of Kotobee Author.
5. To implement the developed E-Module in experimental type of research for further establishment of validity and reliability outcomes.

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