DEVELOPMENT AND VALIDATION OF AN INTERACTIVE LEARNING PACKET IN PLANT AND ANIMAL CELLS FOR GRADE 7 SCIENCE STUDENTS

Argones, Kevin Jhon A.; Sabasales, Matthew T.

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Argones, Kevin Jhon A.[1]; Sabasales, Matthew T.[2]
Master Teacher I[1]; and Master Teacher II[2]
Zamboanga del Sur National High School
Department of Education, Division of Pagadian City
email: kevin.argones001@deped.gov.ph[1]; and matthew.sabasales@deped.gov.ph[2]
09472053137

Abstract

The decline of learner's performance in science and increased learning gaps and learning loss amongst Grade 7 students have compelled the researchers to develop and validate a digital interactive learning material in plant and animal cells. This interactive learning material was materialized out from the use of Macro-operated Microsoft PowerPoint software run with Visual Basic Programming to design the interactive learning material in plant and animal cells. The study employed a developmental research design that aims at developing and validating a learning resource suited for grade 7 students in science. Four (4) expert validators validated the developed learning resource using the DepEd LRMDS tool for non-print media. Moreover, the validation extends to seeking the feedback of the teacher user as well as the possible student end-user of the learning material. The result revealed that the interactive learning material is usable and has high integrity for the learning of the students since the material has been unanimously validated by an expert with positive feedback. The interactive learning material about plant and animal cells provides an engaging and effective way for students to understand the complex structures and functions of these vital components of life. The validated interactive learning packet in biology is recommended for use by students and teachers in the Department of Education.

Keywords: *Digital Interactive Learning Packet, Simulation, Plant and Animal Cell, Development, Validation*

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Context and Rationale

One major devastating effect of the COVID-19 global pandemic in the field of education is the clear increase of learning loss of learners (Schult et al. 2022, 544-563). Several studies conducted recently showed low performance of learners academically especially in science concepts (Cho 2021, 1). In addition, the modular distance learning employed by the Department of Education during the onset of the pandemic has triggered students to get exhausted from the many tasks and overloaded activities the modules contain. This led to the decline of learners' interest in science concepts in general. Pe Dangle (2020) claimed that teachers' lack of concrete reward system throughout the distance learning modality affects the attitude and engagement of the learners in accomplishing the different activities embedded in each module. The lack of self-study ability and limited interactions with others also influence the attitude and engagement of the students during modular distance learning (Pham et al., 2021). As revealed in many testimonies of various teachers and parents, the learner's interest and engagement in science have declined during the modular distance learning applied by the Department of Education (Avila et al. 2021, 1).

This has brought various researchers to find means and ways to improve students' interest in learning science and maximize students' hands-on activities so that they will become much more engaged in the learning process academically (Hudson 2007, 18-22). Since many of the learners today have a meager interest in science and are less engaged in learning science, many attempts to increase learners' interest and engagement by finding suitable interactive, hands-on activities that are aligned with the current trends and interest of the learners themselves. However, interest and engagement only have a short-term effect on the learners and greatly depend on the teacher's efforts. These efforts only superficially touch learners externally and not solely an internal motivation (Luce and Hsi 2015, 70-97).

As a direct observation from the researchers, the student's academic performance in science from grade 7 to grade 10 manifests that the learners have high learning gaps in the different science competencies and they do not have a consistent level of motivation, as revealed from the results of the various assessments as well as the achievement tests conducted by the department. The researchers observed that students' interests and efforts in learning science are less than expected, and few shreds of evidence of poor performance are manifested in their low scores. As Lukwekwe (2015, 41-43) supported, the lack of social presence and inadequate support from facilitators or teachers substantially impact students' performance. Furthermore, the teachers' lack of timely feedback and insufficient technical assistance could affect the students' performance (Muilenburg and Berge 2005, 29-48). If this scenario continues, operational performance and a positive attitude toward science will deteriorate soon. The worst is that this situation diminishes the appreciation, interest, and value of science in society in general.

Due to the rise of computer games and web-based interactive media software, students tend to become less attracted to pedagogical approaches applied by the teachers and they become hooked with this current technological advancement. Students' minds become preoccupied with various web-based social media, like Facebook and Twitter, thus becoming less interested in accomplishing their task in school. This problem was intensified as android-based games, and software programs were readily available free from app stores and the Google play store, which they could install easily into their android mobile devices.

Roblyer and Doering (2009) confirm that computers and the internet have a better way of delivering instruction to learners, thus increasing academic achievement for students. Indeed, by utilizing this android-based learning manipulative as a tool, learners could realize that their android mobile devices are not only for gaming purposes but also for learning science. Demir & Akpınar (2018) claimed that mobile technologies positively affect the attitude and performance of students. Goneda et al. (2021, 74) also supported the idea that incorporating technology like interactive e-learning material and instruction can significantly improve students' interest in understanding science concepts. Using the very common Microsoft PowerPoint with the visual basic macro application as an alternative for making Self-Learning Material (SLM), teachers can create interactive learning packets enriched with images, diagrams, audio backgrounds, 3D, book widgets, questions, and more. Moreover, this could motivate the learners and enlighten them that science learning could be fun, bringing back their interest in the subject as we progress onward to a better educational system in the country. This is very timely since the Department of Education had provided a licensed Microsoft Office 365 available for teachers to use in the educative process.

Because of this, the researchers have decided to utilize this computer program as a tool to be able to produce cost-effective and customizable learning material that could greatly help in increasing learners' interest in science. This material could probably have a more significant impact on the learners that would allow them to increase their internal motivation toward learning science because it is computer-based, and they can manipulate the embedded concepts and context in the program interactively. This study was conducted to develop and validate a digital interactive learning packet in cell biology, specifically in plant and animal cells using MS PowerPoint with the visual basic macro enabled show as platform for the learning packet.

Innovation, Intervention, and Strategy

The innovation that which were utilized in this action research is an interactive self-learning packet in Plant and Animal Cells for Grade 7 science students. Specifically, this lesson on plant and animal cell is within the coverage of the second quarter under the Most Essential Learning Competency (MELC) based code: **S7LT-IIc-3**. The main objective of this competency is to differentiate plant and animal cells according to the presence or absence of certain organelles. Using Microsoft PowerPoint with Visual Basic Macro Application the researchers developed an interactive learning packet in plant and animal cell. These interactive self-learning packets will provide a meaningful exploration for students on the different parts that can be found in the plant cell as well as those parts that can also be found in the animal cell.

Apart from being interactive, colored pictures and illustrations of the different structures found in animal and plant cells were embedded to have a concrete visual and hands on manipulation of the computer could lead the learners to have authentic learning about the targeted specific competency that needs to be learned by the learners. The self-learning packets will also include interactive introduction, audio background, and interactive learning activities, which will provide students with a better experience in learning the lessons. These are the components of the self-learning packet:

Table 1: Parts and Flow of the Interactive Learning Material in Plant and Animal Cell

Parts of the Lesson Flow	Description
Introduction	a feature that provided students an experience to connect the prior concepts to the present lesson to learn.
Audio Background	a feature that provides students a better experience of the concept presented because it could stimulate their sense of hearing while manipulating the learning material.
Illustrations and images	a feature that allows students to see a clearer picture of the image/illustration being presented.
Interactive Activities	a feature that allows students to interact with the activities provided. Interactive in the sense that they can manipulate the computer program to understand the concept.
Interactive assessments	a feature that allows the students to tick the answer of their choice. Moreover, immediate feedback will be provided since feedback directly show whether they got it right or not on the screen.

The researchers believe that developing and validating these online and offline self-learning packets will increase students' attitudes and engagement in learning science, as Goneda et al. (2021, 74) postulated that the use of interactive e-learning designs and other forms of technology in the classroom may boost students' interest in distance learning. Furthermore, Demir and Akpinar (2018) claimed that incorporating mobile learning in modular distance learning significantly affects students' attitudes. The interactive teacher-made self-learning packets were developed based on the most essential learning competencies identified by the Department of Education in the second quarter. This interactive self-learning packet will then undergo a series of validation by the learning resource evaluators of the school's division office under the Learning Resources Management and Development System (LRMDS) to ensure the validity and reliability of the self-learning packet based on the criteria identified by the Department of Education.

Action Research Questions

This action research intends to develop and validate an interactive self-learning packet in plant and animal cells using MS PowerPoint with Visual Basic Macro Enabled Program. Specifically, this action research seeks to answer the following questions:

1. To what extent do expert validators validate the educational soundness of the interactive self-learning packet in Plant and Animal Cells for Grade 7 science students?
2. To what extent do expert validators validate the interactive self-learning packet in Plant and Animal Cells for Grade 7 science students in terms of the following:
    1.1. content quality;

1.2. instructional quality;
1.3. technical quality; and
1.4. accuracy and up-to-datedness?

3. What are the comments/suggestions/recommendations made by the expert validators for the improvement of the learning material?
4. What are the feedback of students and teachers end users of the interactive self-learning packets in Plant and Animal Cell for Grade 7 science students?
5. What final and improved Interactive self-learning packet in Plant and Animal Cells for Grade 7 science students can be made?

Action Research Methods

Research Design

The primary research design employed in this study is the Research and Development design, wherein a mixed-method sequential explanatory research is implemented to qualify and quantify the needed data to finalize the research output. Creswell et al. (2003) consider a mixed-method sequential explanatory research design as an appropriate research design for studies that collect both qualitative and quantitative data. This study starts with phase I, which develops the learning material. It goes along with it the quantitative design. The researchers conducted a descriptive qualitative data gathering method to develop the digital interactive self-learning packet in plant and animal cell. Quantitative data such as quizzes and informal interviews with varied science teachers handling grade 7 science to draw least learned competencies eventually become the basis of the crafting of the learning material.

The second and third phase of the study includes the validation phase. The study employs quantitative, descriptive qualitative and comparative research designs in this sequence. The last and final phase is the qualitative data gathering method wherein the researchers will conduct a face-to-face interview as well as focus group discussion to draw end-users such as the students and the teachers as to how they perceive the implementation of the developed digital interactive self-learning packet in plant and animal cells. By looking at the phases initiated in the data gathering of this investigation, it denotes that after the quantitative data gathering in the first and second phases, it was followed by a qualitative research data gathering in the third and last phase. Having this sequence of qualitative then quantitative research data gathering, the study suits to be following the mixed-method sequential explanatory research design as described by Creswell (2003).

Participants and Other Sources of Data and Information

The study participants include panels of experts designated as division learning resource evaluators specially identified with expertise in evaluating audio, video, and multimedia-enhanced interactive learning materials. These sets of panel experts are asked to validate the developed interactive digital self-learning packet in science 7. 10 randomly chosen students from 2 randomly chosen sections from grade 7 will be the primary respondents of this investigation. They serve as respondents in the drawing of feedback and in determining the usefulness of the learning packet. Out of the 10 students, five (5) will be selected to undergo Focus Group Discussion (FGD) for the qualitative analysis.

Lastly, five randomly chosen science teachers and another five randomly chosen students' parents will be subjected to one-on-one interviews to gain in-depth knowledge and observation of their personal experiences during the implementation of the proposed

intervention. This would substantiate the qualitative analysis of this study, giving much information as to how the interactive self-learning packets affect the achievement, interest, and engagement in learning science concepts. Furthermore, other data sources, such as the learner's scores from the different assessments embedded in the learning materials, the interactive digital self-learning packets that the experimental group utilized, and the self-learning modules used by the control group. This somehow can be utilized as a part of the data analysis to further strengthen the robustness of the results and findings.

Research Instruments

Several research instruments were utilized in the conduct of this research. The first major instrument is the DepEd - LRMDS validation tool for non-print media. This is composed of 4 major validation tools that validate the content, language, and layout of the learning material. It also validates the cultural aspects and the appropriateness of the material for the level of the end-user. The other instrument which was utilized in the data gathering of this investigation is an interview guide which is used in qualitative data gathering where sets of questions are raised to individual participants as well as to focus groups to draw their experiences and perceptions as the end-users. This includes the teachers and learners during the implementation of the interactive learning packet in plant and animal cells.

Data Gathering Procedure

The preliminary stage of this investigation includes the preparation of letter permissions to various concerned participants, including letter permission to gather data to be approved by the school's division superintendent and the respective school principal who oversees the selected school. This will then be followed by asking permission from the parents since the student participants of this study are still in their minor age and need approval from their parents or guardians as part of the research ethics. The last part of the preliminaries is a short orientation of the involved participants for a smooth flow of the investigation.

The main stage of this study is subdivided into two (2) phases, the developmental phase and the validation phase. The first phase includes the developmental stage, where the researcher develops the learning material, which is checked and finalized by sets of experts in content, language, and layout. In this stage, the descriptive qualitative design is employed as the researchers and the experts in content, language, and layout share comments and suggestions to improve the developed interactive self-learning packet in plant and animal cells.

The second phase of the investigation is the validation stage. The developed learning material was subjected to validation of the learning material using the validation tool for non-print specified by the DepEd LRMDS. The validation tools provided by the LRMDS are descriptive, so in this part, descriptive research design is utilized. In this phase, a pool panel of experts in language, content, layout, and technicalities was assigned to check the developed learning material. They provided and gave descriptive ratings to the parts of the learning material for content and phase validity. These sets of panels of experts are chosen based on their qualifications and expertise to ensure the quality output of the learning material.

Moreover, the last and final phase of this investigation is the drawing of comments and feedback from the end users, both the teachers and students, and a panel of experts to further enhance and develop the learning material for maximum effectiveness during its implementation. This step is a qualitative inquiry through a personal interview and

focus group discussion with the end-user of the learning material. This phase draws personal views and perceptions of the participants on their perception of the digital interactive self-learning packet in plant and animal cells.

Data Analysis

The data obtained from this investigation was treated with the most appropriate data analysis method that includes both quantitative and qualitative analysis.

For the first problem, since the validation process includes the use of the DepEd Learning Resource Management System (LRMDS) validation tool for non-print learning material, descriptive statistics was employed, such as the mean and standard deviation, to determine the descriptive level of the learning material as to how the panel of expert assessed it in terms of its usability and appropriateness for grade 7 learners. Computed values from expert validators' scores were interpreted using the four descriptive scales; 1.00 – 1.75 Not satisfactory; 1.76 – 2.50 Poor; 2.51 – 3.25 Satisfactory; 3.26 – 4.00 Very satisfactory. The researchers address the comments and suggestions for improvement from the expert validators and learning resource evaluators to improve the learning material. Moreover, the analysis that was carried out at this level also includes qualitative analysis to address the needed improvement of the learning material as it progresses from the development phase down to the validation phase.

Lastly, a qualitative analysis using thematic analysis was employed to qualify the experiences of both students and the teachers as to how the digital interactive learning packet affected the respondent's achievement level and interest in learning science concepts. The generated themes from the participants' responses served as support that could reinforce the conceptualization of the findings and the basis for crafting conclusions. This could eventually make the results more conclusive and robust, proving what is claimed and argued.

Results and Discussion

This part reports the analyses and interpretations of the data gathered during the development and validation phase of the digital interactive self-learning packet in plant and animal cells for Grade 7 students in science. The summarized data obtained from the investigation is presented through tables, followed by the analysis and interpretation of the data through textual discussion based on the sequence presented from the statement of the problem. Discussions also include the presentation of literature support and arguments to prove what is being claimed in this research endeavor.

Validation of the Educational Soundness of the Interactive Self-Learning Packet. One major criterion that any learning material needs to achieve before it can be allowed by the Learning Resource Management and Development System (LRMDS) of the Department of Education to be used by the learners is the educational soundness of the learning material. The investigation confirms from the result of the responses of the expert validators the educational soundness of the interactive self-learning packet in plant and animal cell. Shown in table 2 below is the educational soundness in terms of integrity, learners focus, usability, and accessibility of the learning packet.

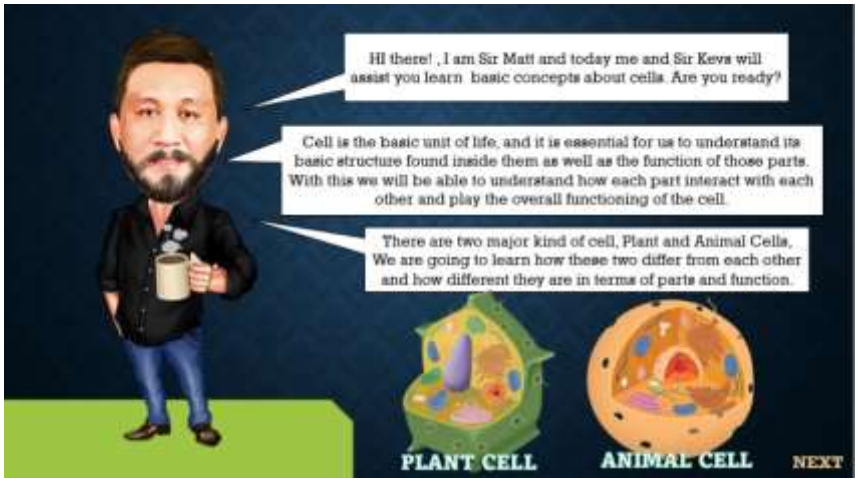
Table 2: Educational Soundness of the Interactive Learning Packet in Plant and Animal Cell

Qualities	Interactive Self-Learning Packet in Plant and Animal Cell	
	YES	NO
1. Integrity	*100%*	*0*
2. Learner focus	*96.88%*	*3.12%*
3. Usability	*100%*	*0*
4. Accessibility	*87.50%*	*12.50%*

As revealed in the table, the overall educational soundness of the validated digital interactive self-learning packet in plant and animal cells garnered 100% in terms of integrity and usability. All validators are unanimous in their rating of giving all YES to the different subdomains in the educational soundness tool from the LRMDS in terms of integrity and usability. This means that the material content is accurate, supports learners' deepening of knowledge, and the language and symbols used clearly support learners in developing content knowledge. Moreover, it is also easy to use and has clear instruction, and the lessons and information provided in the material is easy for the learners to follow. However, a slight variation was noticed in the rating of the validators in terms of Learners' focus (96.88%) and Accessibility (87.50%). Upon looking at the subdomains of these criteria, it was found that one validator noticed that the material does not meet the learners' focus subdomain on having explicit learning objectives. The unrevised interactive learning material given to the validators did not specify the learning objective. Furthermore, one subdomain under accessibility was given NO by one of the validators. This subdomain is about the availability of alternative or equivalent access to information.

The issue of learners' focus was justifiable since the interactive material which were given to the validators before it was updated did not present a clear lesson objective. As confirmed by Shi-Jun Zhang, and Gui-Hua Yu (2017) from their study, presenting an explicit learning objective in e-learning material has a significant positive effect on learners' achievement. Because of this and out of the suggestion given by the validator to include the learning objective, the researchers did a revision of the learning material, and it was redesigned so that a clear presentation of the objective of the lesson will be seen and experienced by the student end users.

Figure 1: Slide Number 2 (Unrevised Introduction)



As shown in slide number 2, the learning material given to the validators did not present the lesson objective. Directly it proceeds automatically towards the main content of the learning material. The updated version reflects the compliance of the researchers on the suggestion given by the validators.

Figure 2: Slide Number 5 (Revised Introduction)

As you can see from Figure 2, the introduction was already moved to slide number 5 with the compliance of the suggestion of the expert validator to specify the learning objectives in the learning material. This is to ensure that the learners will be guided in the flow of the lesson. This revision made in the interactive material makes it to become more learners focus and be able to achieve maximum attention from the end–users of this material.

Another significant criterion that the validated interactive learning material obtained a NO in educational soundness is the unavailable alternative activity present in the learning material, which is part of the accessibility of the educational soundness criterion. Although it was true that there is a need for the material to have a variety of task to achieve maximum exploration of the concept, it was very difficult for the researcher to input another set of interactive activities since adding a new interactive task in the file would entail additional digital unit making it to slow down and disrupt some of the intended feature of the interactive learning material. 87.50% in the accessibility is still high and were able to meet the standard in terms of accessibility.

Cavanaugh (1997) pointed out from their study the success of various interactive distance learning technologies for delivering pre-K-12 curriculum, emphasizing the importance of educational soundness in developing effective learning materials. The article provides valuable understanding of the role of technology in education and the importance of ensuring that educational materials are constructed to meet the needs of learners. In the case of our interactive learning material, this high percentage of approval from the members of the validation team confirms the educational soundness of the interactive learning material in plant and animal cells for Grade 7 science students.

Educational Quality Review and Evaluation. Another major criterion for the validation process essential for the approval of this interactive learning resource material to be used by the learners is the educational quality review and evaluation. This evaluation would quantify the evaluators' ratings of the material in terms of content quality, instructional quality, technical quality, and other findings. Table 3 below shows the summary of the responses of the expert validators in terms of the educational quality of the developed interactive learning material in plant and animal cells for Grade 7 science students.

Table 3: Summary of the Educational Quality Ratings from Expert Validators

Factors	***Mean (M)***	***Standard Deviation (SD)***	**Qualitative Description (QD)**
Content Quality	*3.98*	*0.16*	Very Satisfactory
Instructional Quality	*3.98*	*0.22*	Very Satisfactory
Technical Quality	*3.96*	*0.19*	Very Satisfactory
Other Findings	*4.00*	*0.00*	Very Satisfactory
Overall	***3.98***	*0.14*	Very Satisfactory

Legend: *3.26–4.00 Very satisfactory; 2.51–3.25 Satisfactory; 1.76–2.50 Poor; 1.00–1.75 Not Satisfactory*

As revealed in the table, the ratings of the expert validators are unanimous in almost all domains and factors of educational quality. Expert validators confirm that the interactive learning material in plant and animal cells is very satisfactory (3.98) in terms of content and instructional quality, respectively. In terms of technical quality, it also garnered a rating of very satisfactory. However, it obtained the lowest mean (3.96). The interactive material obtained a perfect rating in terms of the other findings (4.0), but it still falls under the very satisfactory level. It is critical to note that any material which does NOT obtain a perfect rating on the 4th factor (Other findings) will not be allowed to be used by learners in the Department of Education. With regards to the reflected standard deviation (SD) all factors obtained less than one (1) which implies that in almost all domains and sub domains of the validation tool all validators rated almost the same and they rated a score very close to each other. This denotes that the validators are unanimous with their observations regarding the quality of the interactive learning material in plant and animal cells.

In terms of content quality, the result implies that the interactive learning material developed by the researchers were consistent with the topics from the DepEd MELC and it is appropriate to be used by the intended grade level of this learning material. Furthermore, the material is logically organized, free from cultural, ethnic and gender biases and its content is highly relevant to the real-life situations of the learners. The rating further confirms that the Language used is appropriate for the target users. Lastly, this suggests that the content provided in the interactive learning material fosters positive values that reinforce the formative growth of the learners. This result conforms to the findings of Smith et al. (2019) from their study on the importance of content quality to learning material. They highlighted the idea that the content quality of any learning material directly impacts students' understanding of the concept. They argued the need for all digital learning resources to be on the standard level. Otherwise, it won't be able to support student learning in science education effectively.

Another significant result that was revealed from the analysis of the data gathered is the very satisfactory (3.98) rating from the expert validators of the interactive learning

material in plant and animal cells for Grade 7 science students is the Instructional Quality. This is an almost perfect rating, only one validator has given a rating of 3 the rest is already 4. This simply implies that in terms of instructional quality the material clearly manifests high in terms of how the lesson was design. Moreover, it was manifested from the result of the ratings of the expert validators that the level of difficulty is very appropriate to the end user students. It is also vital to note that having this very high instructional quality denotes that the material has effectively chosen graphic design, colors and sounds which were arranged appropriately in an enjoyable, stimulating, challenging, and engaging manner.

For technical quality, the interactive learning material in plant and animal cell obtained a rating of very satisfactory (3.96) however, compared to the other criterion, this is the lowest in terms of educational quality. One validator rated 3 in terms of speech and narration. This is true since the interactive material did not possess such a feature. In addition, it also obtained 3 in terms of visual presentation or the non-text. One validator has decided to rate the material with 3, perhaps due to the lower attractiveness of the design. It was designed this way to lessen the added digital unit of the developed interactive instructional material. Overall, the obtained rating in educational quality confirms that the material is relevant to the learners, and it is ideal to be used by the students for maximum understanding of the concepts presented within the material.

Lastly, the result in the other findings confirms the following: the interactive learning material is conceptual and factual error-free. It also possesses no grammatical errors as well as computational, typographical, information, and errors in the visuals. The result confirms a highly usable interactive learning material that can be used by DepEd students. DeLoache, Miller, and Rosengren (1997) affirm the need for an error-free learning material. It was argued that one major effect, if there are conceptual and factual errors, is the competence of the children to learn and apply new information. They have found out that learners tend to gain low self-trust, which is very damaging to the overall development of the child. The developed interactive learning material in plant and animal cells shows to obtain at the standard level as error-free material. This implies that the interactive learning material in plant and animal cells is quality learning material suitable for use amongst DepEd students.

Comments and Suggestions by Expert Validators. Qualitative findings are also one of the major bases of the validation process. Shown in the table below is the summarized presentation of the different comments and suggestions of the members of the validation team. This summary is subdivided into the different components of the interactive learning material in plant and animal cells. This includes the following: Introduction, Interactive simulation activity, and the Assessment part.

Table 4: Summary of the Comments and Suggestions from Expert Validators

Parts of the Interactive Learning Material in Plant and Animal Cell	Comments/Suggestions
Introduction	• and today, I and Sir Kevs will assist… • two major kinds of cell
Interactive Activity	• add preliminary activity before presenting the concepts. • it would be better if there are short video clips attach per organelle. • include sectioning activities (question form) for the deepening of the concept. • observe proper punction marks like commas and periods then observe proper capitalization of words.
Assessment	• "Take the quiz" instead take quiz. • simplify/rephrase instructions. • the outermost covering of the plant cell is called_____. • the following statements are true about mitochondria, EXCEPT • which of the following states the function of Golgi body? • Which of the following statements is true about chromosomes? • it would be better if you will include letter options for each question (A, B, C, D) • capitalize the first letter of the choices. • which structure of the cell can be found in the plant cell. • Which is the largest among the cytoskeleton structures? • Congratulations for completing the quiz! • congratulations you are done with the quiz! • it would be better to add this sentence "If you have already mastered the plant and animal cells and obtained a perfect score on the quiz, you may click on the exit to end the interactive simulation" after the "if you wish" phrase

These major comments were properly analyzed and considered by the researchers. The first comments and suggestions that were addressed include the minor issues in punctuation marks and capitalizations. This was directly noticed by the validators, which could really have a strong impact on the overall quality of the interactive learning material. Validators also pointed out that the learning material would be more meaningful if there were sectioning activities for each organelle to deepen the understanding of students in the concept/lesson presented. Another comment and suggestion that is common among the validators is that questions in the assessment

need to be simplified as well as the clarity of the question. They have also suggested that options such as A, B, C, and D should be used after each statement/phrase.

Feedback from teachers and student end-users MOVs. Teachers and students' end-users can try the developed interactive learning material in plant and animal cell. Few

Table 5: Summary of the Feedback of Teachers and Student End-users

Parts of the Interactive Learning Material in Plant and Animal Cell	Feedbacks from the teachers and the student end – user
Introduction	• the introduction is simple and catches my attention.
Interactive Activity	• the graphics used in the material is nice and clear. • colorful pictures are pleasing in the eye and capture my interest. • information presented for each organelle is easy to understand. • the interactive activity is user-friendly. • The content was well-organized and presented in a way that was easy for my students to understand. • I thought the interactive learning material was a great tool for learning about cells and I would recommend it to my classmates. • I found the interactive learning material on plant and animal cells to be extremely useful in my classroom. • I really enjoyed using the interactive learning material on plant and animal cells. • The material was also flexible enough to be used in a variety of ways, whether as an independent learning tool or as a supplement to my classroom lessons.
Assessment	• The interactive elements, such as the 2D models and the quizzes, were engaging and helped my students to better retain the information. • The quizzes were also helpful in reinforcing the information I had learned.

The overall feedback of teachers and students as end users of this material shows that the material helps both teachers and students in the delivery of instruction and in learning the concepts of plant and animal cells. As mentioned by one of the teacher participants, the material is extremely helpful *"I found the interactive learning material on plant and animal cells to be extremely useful in my classroom"*. More so, one teacher participant said that the material is flexible and can be used as a tool for

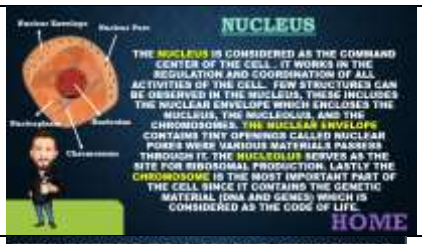
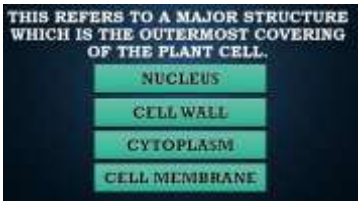
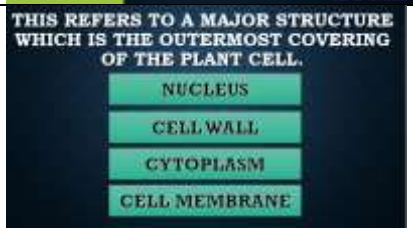
independent learning or a supplementary material inside the classroom *"The material was also flexible enough to be used in a variety of ways, whether as an independent learning tool or as a supplement to my classroom lessons."* The student end-user participant also noted that the interactive learning material is enjoyable *"I really enjoyed using the interactive learning material on plant and animal cells."* The interactive learning material also serves as a great tool for learning and has been recommended to be used by others as one of the feedback items of the student *"I thought the interactive learning material was a great tool for learning about cells and I would recommend it to my classmates."*

Final and Improved Interactive Self-Learning Packet in Plant and Animal Cell. Based on the expert's comments and suggestions for improvement during the validation process, the following revisions are made to make the interactive learning packet more engaging, useful, and helpful to both learners and teachers. The changes from the previous version to the improved version are shown in Table 6.

Table 6: Comparison of the Previous Version and the Final Version of the Interactive Learning Material in Plant and Animal Cell for Grade 7 Science Students

Parts	Previous version	Improved version
Introduction	  	  

		   
Interactive Simulation	  	 

		
Assessment	  	  

The suggestions of the validators clearly improved the version of the interactive learning packet. The following revisions were taken successfully; (1) A slide was added after the first slide for the title of the topic and the most essential learning competency. (2) A revised introduction was made as posited by the expert validators specifically on the language part on how the introduction was written. (3) Proper usage of the punctuation marks throughout the parts of the interactive learning packet were looked at and was changed. (4) The unclickable button in the interactive part of the material was troubleshot to navigate into the next slide. (4) Revision/modification of the instruction in the assessment part was made as suggested by the expert for more clarity. (5) Lastly, the questions in the assessment part of the interactive learning packet were modified/changed as posited by the experts for a clearer thought.

Conclusion and Recommendations

Based on the outcome of the analysis, it was found out that the interactive learning material in plant and animal cell shows to be usable and have high integrity for the learning of the students since the material have been unanimously validated by the expert validators with positive feedback. The interactive learning material about plant and animal cells provides an engaging and effective way for students to understand the complex structures and functions of these vital components of life. The interactive

features such as diagrams and quizzes help students to visualize and remember the key concepts related to cells as reflected in their feedback by the students. Also, the material provides a comprehensive overview of the similarities and differences between plant and animal cells, including their unique organelles and structures. Through this material, students can develop a deeper understanding of the role of the cells. Overall, the interactive learning material about plant and animal cells is an excellent resource for students and teachers.

The validated interactive learning packet in biology is recommended for use by students and teachers in the Department of Education. Teachers should use the interactive learning packet as supplementary material in teaching, considering that students enjoy learning when technology is used by the teachers. Also, students should utilize this interactive learning packet as it helps them learn the topic. In addition, it is further recommended that teachers must undergo training in developing Interactive Learning Packets such as this. Schools should provide training on how to develop interactive learning packets through INSET or SLAC to address the learning style of 21st-century learners.

Furthermore, schools must create a database for learning materials for easy retrieval. Each department should have a database/storage where teachers can easily retrieve/access the developed and validated learning material for teaching-learning process and to safekeep the materials developed. Lastly it is recommended that other researchers are highly encouraged to conduct an enhanced study on developing an interactive learning packet that offers features not found in the developed learning packet.

Action Plan

Republic of the Philippines
Department of Education
Region IX, Zamboanga Peninsula
Division of Pagadian City
Zamboanga del Sur National High School
Pagadian City

Conduct of Seminar Workshop on the Use of Digital Interactive Learning Material in Plant And Animal Cell for Grade 7 Science Students

Subject Focus	Program Description	Objectives	Strategies/ Activities	Time Frame	Persons Involved	Sources of Fund	Expected Outcome
Grade 7 Science	Application of a Digital Interactive Learning Material in Plant and Animal Cell	• Improve proficiency and achievement level in the concept of plant and animal cell	• Digitized SBM MOVs • Upload Digitized MOVs in google drive	First and Second semester	Science Teachers and Students	School MOOE	90% Increase in MPS on concepts on plant and animal cell.
	Seminar – Workshop on the making of interactive simulation using MS PowerPoint 365 with VBA Macro enabled presentation.	Improve teacher's knowledge and skills on the use of MS PowerPoint 365 with VBA and Macro Enable presentation for Instructional development.	Intensive In-service Trainings for Science Teachers The use of MS PowerPoint with VBA Macro enabled presentations.	First and Second Semester	Science Teachers and Teacher Trainers	School MOOE	98% of the teachers were trained on the use of MS PowerPoint VBA Macro enable in making interactive learning material in science.

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Financial Report

The table below includes the total amount of estimates that could expended in the whole duration of the conduct of the study.

General Descriptions	Quantity	Unit	Unit Price	Total Estimated Costs
Short Bond paper sub-20	1	ream	274	274
Ink for printer	4	bottles	269	1,076
Printing and Binding	6	copies	60	360
Ballpen	2	pcs	10	20
White Board Markers	2	pcs	60	120
Snacks for the students and teachers as well as the principal	60	students	35	3,150
Total				5,000

Appendix

Educational Soundness

Indicator	Validator 1	Validator 2	Validator 3	Validator 4	Percentage (YES)	Percentage (NO)
Integrity						
1. *Content is accurate and reflects the ways in which knowledge is conceptualized within the domain.	Yes	Yes	Yes	Yes	100%	0
2. Supports learners' deepening of knowledge within the content domain.	Yes	Yes	Yes	Yes	100%	0
4. Uses language and symbols of the content domain and its ways of representation and supports learners in developing and using them.	Yes	Yes	Yes	Yes	100%	0
5. *The following are used correctly and appropriately: - terms and expressions - symbols and notations - diagrammatic representation - graphical representation	Yes	Yes	Yes	Yes	100%	0
Learner Focus						
7. Uses content in ways that are real to life/authentic for learners/users: - are not over simplified or trivialized - makes sense to learners within their imaginary or real world - are realistic within the relevant context - enhances learners' social capital – their knowledge of how the world works and how to make a way in it	Yes	Yes	Yes	Yes	100%	0
8. Reflects the profile of the target learner/user for the curriculum or training area.	Yes	Yes	Yes	Yes	100%	0
9. Presents the same idea to learners/users in multiple/multidirectional modes - visual text (e.g., pictures, diagrams) - verbal (written) text - symbolic representations - oral (spoken) text - both static and dynamic images	Yes	Yes	Yes	Yes	100%	0
10. Learning objectives are made explicit to learners/users.	Yes	No	Yes	Yes	75%	25%
11. The target learners/users are clearly identified (academic level/technical ability/demographics addressed).	Yes	Yes	Yes	Yes	100%	0

12. Content is structured to scaffold learning.	Yes	Yes	Yes	Yes	100%	0
13. Provides an opportunity for learners/users to obtain feedback either within or outside the resource.	Yes	Yes	Yes	Yes	100%	0
14. Pre-requisite knowledge/skills are clearly identified and their connections to prior and future learning are established.	Yes	Yes	Yes	Yes	100%	0
Usability						
15. Is easy to use (time and effort to use it is reasonable) and the language is appropriate for the intended learner/user.	Yes	Yes	Yes	Yes	100%	0
16. Clear instructions for use are provided (i.e., purpose, processes, intended outcomes are explicit).	Yes	Yes	Yes	Yes	100%	0
17. Learning and information design is intuitive (i.e., the user knows what to do and how to do it).	Yes	Yes	Yes	Yes	100%	0
Accessibility						
18 The learning resource can be accessed by learners/users in deprived, depressed, and underserved areas and communities.	No	Yes	Yes	Yes	75%	25%
19. The resource may not require teacher/facilitator intervention to be used effectively in varied learning environments and learning sequences (i.e.it may include instructions, terms, material in English/Filipino/local dialect as maybe necessary).	Yes	Yes	Yes	Yes	100%	0
21. *Resource does not confront or embarrass learners In any or all of the following ways: - require learner to expose personal data which may embarrass them - invade learners' privacy - unfavorably compare learners' learning performance with learners' identity - unfavorably or stereotypically compare family or community characteristics with learners' identity - unnecessarily or indiscriminately confront cultural beliefs or practices	Yes	Yes	Yes	Yes	100%	0
22.. Equivalent or alternative access to information is available for learners with diverse needs. - identical content or activity is presented in different modalities - different activities that achieve the same learning outcome are available	No	Yes	Yes	Yes	75%	25%

Quality Evaluation Rating for Non-Print Materials

Indicator	Validator 1	Validator 2	Validator 3	Validator 4	Mean
Factor A: Content Quality					
1. Content is consistent with topics/skills found in the DepED Learning Competencies for the subject and grade/year level it was intended.	4	4	4	4	4
2. Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives.	4	4	4	4	4
3. Content is accurate.	4	4	4	4	4
4. Content is up to date.	4	4	4	3	3.75
5. Content is logically developed and organized.	4	4	4	4	4
6. Content is free from cultural, gender, racial, or ethnic bias.	4	4	4	4	4
7. Content stimulates and promotes critical thinking.	4	4	4	4	4
8. Content is relevant to real-life situations.	4	4	4	4	4
9. Language (including vocabulary) is appropriate to the target user level.	4	4	4	4	4
10. Content promotes positive values that support formative growth.	4	4	4	4	4
Factor B: Instructional Quality					
1. Purpose of the material is well defined.	4	4	4	4	4
2. Material achieves its defined purpose.	4	4	4	4	4
3. Learning objectives are clearly stated and measurable.	4	3	4	4	4
4. Level of difficulty is appropriate for the intended target user.	4	4	4	4	4
5. Graphics / colors / sounds are used for appropriate instructional reasons.	4	4	4	4	4
6. Material is enjoyable, stimulating, challenging, and engaging.	4	4	4	4	4
7. Material effectively stimulates creativity of target user.	4	3	4	4	3.75
8. Feedback on target user's responses is effectively employed.	4	4	4	4	4
9. Target user can control the rate and sequence of presentation and review.	4	4	4	4	4
10. Instruction is integrated with target user's previous experience.	4	4	4	4	4
Technical Quality					

1. Audio enhances understanding of the concept.	4	4	4	4	4
2. Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.	4	3	4	4	3.75
3. There is complete synchronization of audio with the visuals, if any.	4	4	4	4	4
4. Music and sound effects are appropriate and effective for instructional purposes.	4	4	4	4	4
5. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.	4	4	4	3	3.75
6. Visual presentations (non-text) are clear and easy to interpret.	4	4	4	4	4
7. Visuals sustain interest and do not distract user's attention.	4	4	4	4	4
8. Visuals provide accurate representation of the concept discussed.	4	4	4	4	4
9. The user support materials (if any) are effective.	4	4	4	4	4
10. The design allows the target user to navigate freely through the material.	4	4	4	4	4
11. The material can easily and independently be used.	4	4	4	4	4
12. The material will run using minimum system requirements.	4	4	4	4	4
13. The program is free from technical problems.	4	4	4	4	4
Factor D: Other Findings					
1. Conceptual errors.	4	4	4	4	4
2. Factual errors.	4	4	4	4	4
3. Grammatical and / or typographical errors.	4	4	4	4	4
4. Other errors (i.e., computational errors, obsolete information, errors in the visuals, etc.).	4	4	4	4	4