Development and Validation of a Multimedia Based-Module in Science for TVL Track

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Abstract

This study aimed to develop and validate a multimedia-based module in teaching Physical Science among Senior High School students under the Technical-Vocational- Livelihood Track. This research made utilized the Rapid Application Development (RAD) in developing the module using the Microsoft Visual Studio with Visual Basic as the Programming Language and also used the Research and Development Design (R & D) in validating the said module. After the development phase of the multimedia-based module, Science and IT experts were asked to evaluate the developed module. Results showed that the Level of Validity of the developed Multimedia-Based Module is Highly Valid along its Content, Format, Presentation and Organization, Accuracy and Recency of Information. The Online Readability Index of the Multimedia Based Module is appropriate for Grade 11 learners.

Keywords – develop, experts, multimedia, module, user, validate

INTRODUCTION

Teaching serves as an important medium for achieving institutional goals of enhancing students' knowledge and learning by engaging them in learning activities to prepare for future use. Teachers are always looking for ways and means to accomplish things and to make science activities more meaningful to lifelong learning.

Learners are presently ready to completely envision the inward workings of different ideas that were not, in any way, shape or form, clear before in a course reading or such. Utilizing advanced instructional materials, particularly the one with a profound intuitive point, would amazingly get the learners' consideration and make them want to learn as opposed to being put a course book to their appearances. Furthermore, these teaching materials shall drive them to understand words and numbers on a page and expecting that it should be very simple.

With the utilization of computerized simulations, ideas which are exceptionally hard to comprehend turned out to be less demanding to get a handle on. This is on account that it gives the understudies a solid visual case of what is occurring while describing the said idea. An example is the nuclear structure, which is near undetectable by the naked eye and even with other mechanical guides. Utilizing computerized reproductions would extraordinarily help learners to conceptualize the idea that would be viewed as a strict spec in this endless world [1].

The utilization of instructional material [2] has been a custom in educating for its impact in the instructing learning procedure so he urged educators to use instructional materials to enhance their guidelines and make the instruction processes more engaging learners.

Learning using interactive multimedia-based scientific approach has an important role in improving students' learning experiences and proven to provide motivation to students because learning using interactive multimedia-based scientific approach students love to learn in the presence of a combination of image display, animation, audio, and graphics are packed in the form applications that can be used using a computer[3].

The Interactive Multimedia Technology empowers the educational process by means of increased interaction between teachers and students and utilization of technology in the instructional media development has an important role in the increase of the quality of teaching and learning environments of the students which provide concrete experience and integration.[4].

With the advancement of technology in the recent times, different approaches to facilitate teaching and learning are needed in order to adapt to the trend and pace of cognitive development of the new generation of learners. One such approach is through interactive learning module [5].

In general, the study is connected to the Cognitive Theory of Multimedia Learning (CTML) which tries to address the issue of how to structure multimedia instructional practices and employ more effective cognitive strategies to help people learn efficiently [6].

MATERIALS AND METHODS

Research Design

This study used Research and Development (R & D) Design which is the process used in developing and validating educational products [7]. In this study, the term "product" referred to the developed interactive instructional material. This focused along the status and validity of the multimedia-based module. The Research Development Design covered all the planning phase, the development phase, and the validation phase of the interactive instructional material and module in teaching Physical Science.

Rapid Application Development (RAD) was also used as the methodology in designing and developing the Multimedia Based Module which composed of four stages namely Requirements Planning, User Design, Rapid Construction and Transition.

The Requirements Planning (RP) is the combination of elements of the system planning and systems analysis phases of the system development life. In the User Design (UD), the users interacted with system analysts and develop models and prototypes that represented all system processes, inputs and outputs. The Rapid Construction (RC) focuses on program and application development task similar with the SDLC. The Transition (TR) Cutover resembles the final tasks in the SLDC implementation phase including data conversion, testing, changeover to the new system and user training. The Flesch Reading Ease formula, The Flesch-Kincaid Grade Level, the Fog Scale (Gunning Fog Formula), The Smog Index, The Coleman-Liau Index, Automated Readability Index and Linsear Write Formula were used to determine the readability index of the multi-media-based module.

Instrumentation

The researcher utilized a survey form that was used in determining the status of existence of multimedia-based module, its availability, adequacy, accessibility and usability. Another set of questionnaires from the DepEd rating sheet for print materials was adopted and used in validating the module as instructional material in teaching Physical Science.

Data-gathering Procedure

The researcher secured a written permission from the Schools Division Superintendent and the Education Supervisor in Science in Tarlac Province, the principal of Victoria National High School in Victoria and Tarlac National High School, in Tarlac and the Dean of Pangasinan State University – School of Advanced Studies and the Dean of IT Department- College of Computing to conduct the study. The researcher worked on the instruments needed in the pursuit of the study and in developing the interactive instructional material then, the researcher consulted literature, evaluated and validated the module. The researcher asked the assistance of a computer programmer to make the interactive instructional material. The experts' comments and suggestions were considered in improving further the module. After developing the module and gathering the pertinent data needed the researcher then proceeded to the analysis and interpretations of the gathered data and came up with such conclusion about the validity of the developed module.

Statistical Treatment

The status of the material along Availability, Adequacy, Accessibility and Usability were determined using counting. The level of validity of the module along Content, Format, Presentation and Organization, and Accuracy and Recency of Information mean were employed. The level of validity of the module along the given areas were employed, following ranges with their corresponding descriptive rating:

Range   Descriptive Rating
3.5 – 4.0Highly Valid (HV)
2.5 – 3.4Valid (V)
1.5 – 2.4Slightly Valid (SV)
1.0 – 1.4Not Valid (NV)

The readability index of the material was determined using the online readability software. On this process, it analyzed the text of the multimedia and output the results based on the seven (7) readability formula. The tool determined the grade level based from the comprehend text of the instructional material.

RESULTS AND DISCUSSION

Status of the Existing Multimedia Based Module in Physical Science

Interview and survey were conducted to determine the status of the existing multimedia-based module ready for the utilization for every department concerned if there is any. Based on the result of the interview and survey, it was found out that there is no existing multimedia based module in Physical Science since the implementation of the Senior High School is on its third year and the available materials are the curriculum guide and teaching guide in the subject and in developing their own presentation in presenting their lessons.

The Least Learned Topics in Physical Science

There are lot factors that might affect perception as well as meaningful learning. In his learning model, White (1993) expresses that factors such as attitude, skill, and knowledge, physical state and needs might affect learning.

From Johnstone's point of view (1991), the difficulties in science may be related to the problems of perception and thinking. He argues that the analysis of the nature of the topics that are perceived as difficult by the students leads to a realization that their complexity lies in the fact that the ideas and concepts inherent in them exist on three different thought levels: the macro and tangible, the micro (or even sub micro and molecular) and the representation.

Validity Level of the Multimedia Based Module

Quite difference but nevertheless both evaluations rated as 3.7 which was described as Highly Valid. This indicates that the content of the multimedia based module is highly valid which is suitable to the students level of development, that this module can contribute to the achievement of specific objectives, that it can provide for higher development of higher cognitive skills, that is free from ideological, religious, racial and gender biases and prejudices, that it can help enhance the development of desirable values and traits, that it

arouses interests and it provides topics where safety and health are concern. The results of the evaluation of Science and IT Experts on the Validity of the Multimedia-Based module along the Content revealed that they have different perceptions as shown by the results of each indicator. The Average Weighted Mean of the Science Experts is higher with a rating of 3.8 and the results of the evaluation of the IT Experts along the Content is lower which was rated as 3.6.

Format of the Multi-Media Based Module

In summary, as a result of evaluation, in term of format, the multimedia-based module is highly valid. This signifies that the prints, illustrations, design and lay-out as well as the graphics and animation in multimedia-based module are all appropriate. After evaluating the content and format, the presentation and organization of the multimedia- based module was then evaluated. Table 3.3 shows the evaluation of the science experts.

As seen in Table 3.3 (Please refer to the original article), it was found out that the presentation and organization of the multimedia- based module is highly valid after gaining a total rating of 3.74 for Science Experts and 3.38 for the IT Experts with an average mean of 3.56.

This indicates that the multimedia based module is interesting, engaging and understandable, that there is a smooth and logical flow of ideas, that the vocabulary level is adapted to target reader's experience and level of understanding, that the length of sentence is suited to the comprehension level of the target clientele, and the sentences and paragraph structures are varied and interesting.

Table 3.5 presented the results on the evaluation conducted to science and IT experts on the Validity Level of the Multimedia Based Module based on the four (4) criteria and indicators given which include the Content, Format, Accuracy and Recency of Information and Presentation and Organization. Based on the results, the Content has the highest score with a rating of 3.7, followed by other indicators in a decreasing order, the Format, with a rating of 3.65, the Accuracy and Recency of Information, with a rating of 3.62, and Presentation and Organization, which has the lowest score, with a rating of 3.56. All the factors or indicators were described as Highly Valid.

Science Experts point of view on the Validity Level of the Multimedia Based Module is different from the IT experts as shown in the results, Science experts total score is 3.75 and the latter is 3.55, though, when merged the overall mean is 3.63, and they were both described as Highly Valid. Different inclinations of both experts are considered one factor that is why they have different perceptions on the Content, Format, Presentation and Organization, Accuracy and Recency of Information.

Readability Index of the Multimedia- Based Module

Based from the results of the Online Readability Index, the developed multimedia-based module for the ten least learned topics was appropriate for Grade 11 learners. Though, the reading level of the two out of the ten least learned topics - Competencies 3 and 6 respectively are fairly to read which are suited to 13 to 15 years old. This means that if can be understood by the lower grades the more it is understood by the grade 11 learners. topics - Competencies 3 and 6 respectively are fairly to read which are suited to 13 to 15 years old. This means that if can be understood by the lower grades the more it is understood by the grade 11 learners.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the validation, the following conclusions were drawn:
There is no available Multimedia Based Module [10]. The Least Learned Competencies are a.) Give evidence for and explain the formation of the light elements in the Big Bang Theory b.) Describe the contributions of the alchemists to the science of chemistry c.) Describe the nuclear model of the atom and its major components d.) Explain the effects of intermolecular forces on the properties of substances e.) Explain how the structures of biological macromolecules determine their properties and functions f.) Use simple Collision Theory to explain the effects of concentration, temperature, and particle size on the rate of reaction and Recognize that energy is released or absorbed during chemical reaction g.) Explain each Newton's Three Laws of Motion h.) Describe what happens when light is reflected, refracted, transmitted and absorbed I.) Cite examples of Waves and j.) Explain how Brahe's innovations and extensive collection of data in observational astronomy paved the way for Kepler's discovery of his laws of planetary motion and Apply Kepler's 3rd law of planetary motion to objects in the solar system.The Science Experts' evaluation on the developed Multimedia Based Module is Highly Valid on the Content, Format, Presentation and Organization, Accuracy and Recency of Information. The Science and IT Experts' evaluation on the developed Multimedia Based Module is Highly Valid on the Content, Format, Presentation and Organization, and Accuracy and Recency of Information, The

Online Readability Index of the Multimedia Based Module is appropriate for Grade 11 learners.

RECOMMENDATIONS

Experts or teachers should learn to innovate learning resources by developing a multimedia- based module in every subject not only in Science which will serve as a supplementary learning material. Developed Multimedia Based Module must be adequate so that this will be available to all schools whether it is a big or small school. If the module is available in every department, it must be accessible to all and must utilized by all learners. Teachers should develop learning materials to enhance mastery of the least learned topics in a subject.The module should be properly aligned along with the criteria or factors used in validating it. The content should be suitable to the student's level of development and material should contribute to the achievement of specific objective of the subject area, the Format should follow the standard criterion to have appropriate Prints, Illustrations, Design and Lay-out, Graphics and Animations. When it comes to its Presentation and Organization, its presentation must be engaging, interesting and understandable. There should be a logical and smooth flow of ideas as well. For the Accuracy and Recency of Information, information presented must be recent and upgraded, properly checked the developed module to avoid conceptual, factual, grammatical, typographical and other minor errors. The texts of the developed modules should be simplified so that it will be easily comprehend by a target user or level. For the future researchers, this study may be used for another study wherein the impact analysis of the multimedia-based module will be the subject of the study. This will test the effectiveness of the multimedia-based module in improving students' performance in Physical Science.

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