

# Development of an Electronic Module (E-module) Based on Quantum Learning on Living Creatures Classification Material

Mellia Laura Pitri<sup>1\*</sup>, Zelhendri Zen<sup>2</sup>, Indrati Kusumaningrum<sup>2</sup>, Fetri Yeni J<sup>2</sup>

<sup>1</sup> Education technology of Postgraduate Program, Universitas Negeri Padang, Padang, Indonesia.

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Corresponding Author:

Mellia Laura Pitri

[mellialaura021@gmail.com](mailto:mellialaura021@gmail.com)

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**Abstract:** The aim of this research is to develop a quantum learning-based e-module for class VII SMP science subjects, especially material on the classification of living things. The type of research is development research (Research and Development) with the ADDIE development model. The research development procedure consists of 5 stages: Analyze, Design, Development, Implementation, and Evaluation. Validity testing of electronic module products is carried out by 3 validators, namely 1 media validator, 1 material validator, 1 language validator. The practicality test was carried out on 1 educator and 31 students with the aim of finding out the practicality of the product being developed. The data collection tool is a questionnaire. The results of the media expert validity test were 75% in the valid category, the material expert validity test was 89.7% in the valid category, and the language validity test was 96.7% in the valid category. The results of the practicality test for educators were 79% in the practical category and the practicality test results for students were 82% in the very practical category. The effectiveness test used the t-test, the calculated t-value was 16.17. Meanwhile the t-table is 1.697, then (16.17 > 1.697). The calculation concluded that there was a significant difference between the pre-test and post-test. Based on the results of validity, practicality and effectiveness tests, it was concluded that the Quantum Learning-based electronic module (e-module) was suitable for use in the learning process for class VII middle school class VII material on the classification of living creatures.

**Keywords:** Classification of Living Things; Development Research; Electronic Module (e-module) Based on Quantum Learning

## Introduction

Education is a medium that plays a very important role in creating quality and potential human beings in the broadest sense, through education there will be a process of self-maturation so that in the decision-making process regarding something faced, it is always accompanied by a great sense of responsibility. Considering the role of education, this aspect should be of concern to the government in order to increase the quality of Indonesian society's resources.

Improving quality community resources cannot be separated from the development of science and technology which is felt to be so rapid, that it influences

almost all aspects of life, including in the field of education, which is an inseparable unit. Basically, the development of science cannot be separated from two ways, namely the curiosity drive possessed by all normal humans and the practical use of knowledge obtained from reflection and investigations.

The development of science itself in learning activities requires an increase in the quality of education. One thing that science subjects should pay attention to is improvement science learning achievement of students at school. Natural Sciences (IPA) is one of the learning content in schools. Science subjects equip students with knowledge, ideas and concepts about the natural environment, which are obtained from experience

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through a series of scientific processes, including investigation, preparation and ideation (Lestari, 2019) in (Nurhasyinah et al., 2023). Therefore, science activities that require thinking can be a means of improving the quality of human resources in Indonesia, especially in terms of improving their thinking abilities. Students' thinking abilities will influence their personality development (Badri et al., 2019). Science education can also help a person develop understanding and thinking habits, as well as enable students to master many life skills. The skills in question are observation, prediction and scientific attitude. Science has a long history of creating new knowledge and applying it to human life on a large scale, including encouraging technological development (Fridani et al., 2020).

This research focuses on developing electronic modules (e-modules) based on the Quantum learning model in class VII middle school class VII classification of living things. Natural science (science) subjects have complex material and require attention during the learning process so that students can understand the concept of the characteristics of living things, classification of living things, how to classify living things and the dichotomous key and the key to determination in depth. Because of that, uses electronic modules (e-modules) which are integrated with the Quantum Learning learning model.

The Quantum Learning Model is a learning model that contains instructions, strategies, and learning processes which is made fun and meaningful (Agusnanto, 2013) in (Nurhidayat, 2022). The Quantum learning model also provides awareness for learners, especially students, about the importance of learning. One of the reasons for the growing awareness among students is the existence of AMBAK (What are the Benefits For Me). AMBAK is motivation obtained from mentally choosing between the benefits and consequences of a decision (Porter and Hernacki, 2015). This explains it that in every student there will be embedded strength in the form of encouragement to do something because learning promises benefits for him or it can be said the emergence of the power of AMBAK. Apart from that, design a democratic learning atmosphere, learning from each other and fun also provides greater opportunities to empower students' potential optimally so that less interesting learning can be overcome because students are invited to learn in a more comfortable and enjoyable atmosphere, and are freer to discover various new experiences in their learning.

Apart from that, the e-module also contains study instructions which are arranged coherently and systematically, this is what will help students understand the concepts and material of science subjects. With e-modules, students can repeat or re-

study the material according to their needs because e-modules can be studied independently at home. The benefits of using E-Modules as a learning resource include, it can train students' independence in learning and not depend on other parties, there is content such as sound and video, and a user-friendly display that makes it easier for students to use it. The criteria for good learning software are flexibility, easy updating, related content, validity and ease of use. The advantage of E-Modules is that they are easy to carry anywhere, do not require paper and ink so costs are cheaper and distribution is easier (Fuadah, 2016).

In accordance with research conducted by Yusuf (2014) in (Sulistiyorini et al., 2018) shows that the science learning outcomes of students who follow the Quantum Learning learning model are better than conventional learning models. This research shows that the Quantum Learning model can make a contribution in a positive direction towards student attitudes and learning outcomes.

Quantum Learning is very suitable for the learning process. Where the advantages of Quantum Learning are that it directs students to think logically, fosters and creates an enthusiastic attitude in students where the interaction between educators and students in the learning process has a big influence when participating in learning, fosters an attitude of cooperation between students, creating confident behavior and attitudes in students, as well as creating an enjoyable learning process. (Oktaviana & Sari, 2017) The use of the Quantum learning model is considered capable of being an alternative for learning renewal, because it provides practical and specific instructions for creating an effective learning environment, how teachers design learning, deliver learning material, and how to simplify learning. a process that makes it easier for students to learn. (Hidayat & Rochmadi, 2020).

This research aims to develop a quantum learning-based e-module for the science subject classification of living things in class VII of junior high school. The e-module developed can be used as a digital learning resource that can support independent learning for students. The e-module developed is a valid, practical and effective e-module for use in the learning process. The importance of this research is that it becomes a learning resource for students in the learning process both at school and at home which can support the learning process independently without limitations.

## Method

The type of research used in this research is development research or known as R&D (Research and Development) which can be interpreted as a research

method that refers to creating or developing inventions in the form of a product or service aimed at providing solutions and solving problems or creating useful knowledge new (Yolanda & Wahyuni, 2020). (Research and Development is a research method used to produce certain products, and test the effectiveness of these products (Sugiyono, 2013).

The data collection techniques of this research include validity test analysis. Validity test analysis data obtained from experts were analyzed using media quality criteria and used as a developed learning media. The results of the assessment by experts are processed using Aiken's V statistics as follows (Azwar 1997):

$$V = \frac{\sum S}{[m(c-1)]} \tag{1}$$

Information :

V : Validity Score

S :  $\sum s$  ( s = r-lo)

lo : The lowest validity rating score

r : The number given by an appraiser

c : The highest validity rating score

m : Number of items

The value of V obtained is then interpreted into a validity classification as shown in Table 1.

**Table 1.** Validation Criteria (Azwar 1997)

Achievement Level	Category
0.667-1.00	Valid
< 0.667	Nvalid

Practicality Test Analysis, practicality analysis was carried out after all questionnaires were filled out. This practicality analysis is used to analyze the observed data using e-modules based on the 5E Instructional Model. The data from filling out the questionnaire will then be added up and analyzed using the formula proposed by (Riduwan, 2012).

$$P = \frac{R}{SM} \times 100 \% \tag{2}$$

Information :

P = Practicality value

R = Score Obtained

SM = Maximum Score

According to (Syafri 2010) the effectiveness formula used to test the descriptive hypothesis is to use a formula with the following steps:

- a. d = pre test score - post test score
- b. Calculates the mean difference

$$Md = \frac{\sum d}{N} \tag{3}$$

c. Calculating using the t formula:

$$t = \frac{Md}{\sqrt{\frac{\sum x^2 d}{N(N-1)}}} \tag{4}$$

Information :

Md = the mean of the difference between pretest and posttest

$\sum x^2 d$  = the sum of the squared deviations

N = number of samples

The results of these calculations are then compared with the t-table. If the results of t-count < t-table, it can be concluded that there is no significant difference between the pre-test and post-test values, and vice versa.

## Result and Discussion

The electronic module (e-module) development process uses the ADDIE research model with 5 (five) main stages, namely Analysis, Design, Development, Implementation and Evaluation. Each stage has a development process that is tailored to the needs of the research.

Analysis Stage (Analysis), the analysis stage is carrying out needs analysis, curriculum analysis, concept analysis and student analysis. Therefore, the output that we will produce is in the form of characteristics or profiles of prospective study participants, combining combinations, combining needs and detailed concept analysis based on needs.

The analysis stage is the first stage in applying the ADDIE model in developing electronic modules in the form of E-Modules. This analysis stage is needed to determine the activities to be carried out at this stage in the form of:

### Needs Analysis

At the needs analysis stage, it will be determined what media needs to be developed to help students' learning process. Needs analysis aims to see and understand the description of the conditions or basic problems that occur related to the learning process in schools experienced by educators and students, as well as finding appropriate solutions to support the learning process. At this stage the methods used are observation and interviews with educators.

### Curriculum analysis

The design of electronic media modules (e-modules) is very closely related to the curriculum. The

analysis of this curriculum aims to determine the suitability of the material for the classification of living things to the current curriculum so that the electronic module (e-module) media that will be created can be in accordance with the objectives of developing the media. Media design requires consideration of the curriculum to determine the learning objectives (TP) and the flow of learning objectives (ATP) that must be achieved by students in learning so that learning outcomes (CP) can be achieved.

#### *Concept analysis*

Analysis of this concept aims to determine the content of the material and the extent to which the material will be contained in the media being developed. Determining the material can be done by looking at the topic, sub-topic as well as the content of the material to be taught and the competencies expected through the learning outcomes (CP) of the lesson. In this research, the material taken in relation to the development of electronic modules (E-Modules) is science subjects which are in accordance with the applicable curriculum, namely the Merdeka Curriculum. The material taken is (1) Characteristics of living things, (2) How to classify living things, (3) Classification of living things, and (4) Classification of the five kinds.

#### *Analysis of student characteristics*

Student analysis is carried out to determine the problems faced by students in the learning process, so that the development of electronic modules (E-modules) can be designed according to the learning characteristics required by students.

#### *Analysis of learning objectives*

This stage is carried out to formulate the results of student analysis and concept analysis into learning objectives (TP) which then become IKTP (indicators of achievement of learning objectives). The results of the formulation of learning objectives will be the basis for designing the development of electronic modules (e-modules) based on Quantum Learning on the material for classifying living things in class VII SMP.

#### *Design Stage (Design)*

After carrying out various needs analysis, curriculum analysis, student analysis, concept analysis and learning objective analysis. Researchers began to carry out the media design stage aimed at science subjects, material on the classification of living things, for class VII junior high school students.

##### *a. Preparation of Test Standards*

At the standard stage, this test is carried out to prepare tests that are used as a tool to determine students' abilities and are used as an evaluation tool in

the learning process. The preparation is carried out in accordance with Learning Achievements (CP) in science subjects, especially material on the classification of living creatures. The function of this test is to measure students' abilities as an evaluation tool after implementing the Quantum Learning-based electronic module (e-module) on the Classification of Living Creatures material. These tests are pretest and posttest. The test is structured as multiple choice (objective test) with a total of 20 questions in the test.

##### *b. Media Selection*

In this research, an electronic module (e-module) based on Quantum Learning on the Classification of Living Creatures class VII SMP material was chosen which was designed using the main application, namely Canva. This software was chosen because the software supports creating animations, images, navigation (instructions), creating buttons, and can integrate text, sound and video to become an electronic module (e-module) that can be run on mobile phones (HP) and computers. Therefore, Canva software was chosen for developing electronic modules (e-modules).

##### *c. Format Selection*

The format of the electronic module (e-module) based on Quantum Learning in the Classification of Living Creatures material for class VII SMP is in HTML5 form which is provided in the form of a link to students, where students can access the electronic module (e-module) by clicking on the link which are given.

##### *d. Create an initial design (intian design)*

The design stage was carried out from April to May 2023. At this stage the researcher prepared the elements required by the electronic module (e-module), such as preparing instructions for use and learning instructions, the framework of the electronic module (e-module), references used in developing material in electronic modules (e-modules) as well as instruments used to assess the electronic modules (e-modules) being developed.

##### *1) Flowchart*

The design stage begins with creating a flowchart from an electronic module (e-module) based on Quantum Learning material for the classification of living things for class VII SMP.

##### *2) Storyboarding*

After the flowchart is created, the next stage is to create a storyboard. Storyboard is a development of flowchart which explains the lines and symbols in the flowchart.



e. *Creating electronic modules (e-modules) based on Quantum Learning*

The steps in making an electronic module (e-module) Electronic Module (e-module) Based on Quantum Learning on the Classification of Living Creatures Material for Class VII SMP using the Canva application are as follows:

1) Create an electronic module cover page (e-module)

On the cover page there is the title of the electronic module (e-module), the title of the material, an image that characterizes the material, the class identity, and the name of the department.



Figure 1. Cover page for electronic modules (e-modules) based on Quantum Learning

2) Instructions for use

Instructions for using electronic modules (e-modules) contain information in the form of directions for using electronic modules (e-modules) for both educators and students so that they are more focused, systematic and optimal in their use.

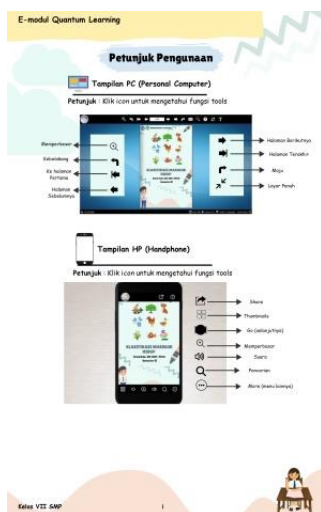


Figure 2. Display of Instructions for Use

3) Table of Contents

The table of contents contains pages accompanied by information about the page name and page number to make it easier for users to find the page they want. Users can go to the desired page on the electronic module (e-module) by clicking directly on the table of contents page that has been written in the table of contents.



Figure 3. Table of Contents Display

4) Learning Instructions

Learning instructions in electronic modules (e-modules) contain information in the form of directions for learning in electronic modules (e-modules) for both educators and students so that they are more focused, systematic and optimal in their use.



Figure 4. Display of Learning Instructions

5) Learning Outcomes

Learning outcomes contain learning objectives and attitudinal competencies that students are expected to

achieve in the learning process. The display of learning outcomes is as follows:

**E-modul Quantum Learning**

**Capaian Pembelajaran**  
Peserta didik mampu melakukan Klasifikasi Makhluk Hidup yang diamati.

**Tujuan Pembelajaran**

1. Mengelompokkan benda berdasarkan sifat
2. Menjelaskan ciri-ciri makhluk hidup
3. Mengklasifikasikan makhluk hidup dan benda
4. Mengelompokkan makhluk hidup berdasarkan karakteristiknya melalui observasi di lingkungan sekitar
5. Membuat kunci dikotom dan kunci determinasi
6. Menjelaskan bagian dari mikroskop

**Kompetensi Sikap**

1. Jujur
2. Disiplin
3. Bertanggung jawab
4. Peduli

**PETA KONSEP**

**Klasifikasi Makhluk Hidup**

Diagram showing classification of living organisms into Kingdoms (Plantae, Animalia, Fungi, Protista, Monera) and their characteristics.

Kelas VII SMP

Figure 5. Display of Learning Achievements

6) Learning Activities in the Learning Process

Learning activities are the core of the content of electronic modules (e-modules). Learning activities are structured and systematic. Learning activities begin with an explanation of instructions for use and learning objectives. After that, there is a description of the material which is equipped with visualizations and videos to make it easier to understand the content of the material. After reading and listening to the description of the material and video, students can do independent assignments, group assignments, and learning activities in the Quantum Learning learning model provided and continue by doing exercises on each sub-material and evaluation, namely multiple choice questions about the material.

**E-modul Quantum Learning**

**KLASIFIKASI MAKHLUK HIDUP**

**Pengantar**

Segala sesuatu yang ada di sekitar kita terdiri atas benda-benda. Perhatikan air yang biasa diminum, udara yang dihirup setiap saat, atau uang logam yang digunakan sebagai alat tukar. Tanyakan atau apakah benda-benda tersebut? Air (H<sub>2</sub>O) merupakan zat cair yang terwujud atas 2 atom hidrogen (H) dan 1 atom oksigen (O). Udara yang dihirup merupakan gas dengan unsur nitrogen zat padat yang terdiri atas campuran berbagai gas.

**"Gerbang Ilmu"**

Tahukah kalian dengan benda ini? Gambar di samping merupakan gambar mikroskop. Fungsinya adalah untuk melihat benda-benda yang sangat kecil yang tidak dapat dilihat oleh mata biasa.

**Ciri-Ciri Makhluk Hidup**

Pengantar yang dilakukan disekitar akan memberikan pengetahuan mengenai berbagai jenis benda yang terdapat di alam. Ditinjau dari segi terapan berbagai jenis makhluk hidup meliputi tumbuhan, hewan, manusia, dan bakteri mikroorganisme yang hanya dapat dilihat menggunakan alat bantu. Selain itu, juga terdapat benda tak hidup seperti meja, kursi, alat transportasi, tanah, air, dan sebagainya.

Benda-benda tersebut memiliki karakteristik yang dapat menggambarakan suatu benda termasuk benda hidup dan benda tak hidup. Benda hidup memiliki ciri-ciri seperti dapat bergerak, tumbuh, berkembang, bernapas, memerlukan energi, peka terhadap rangsangan, dan sebagainya. Contohnya hewan, tumbuhan dan manusia.

Benda tak hidup juga memiliki ciri-ciri berbeda dari ciri-ciri benda hidup. Contohnya mobil dan jam dinding yang dapat bergerak. Kemampuan gerak ini dipengaruhi oleh mesin dan bahan. Mobil dan jam dinding tidak

Kelas VII SMP

Figure 6. Display of material in learning activities

7) Bibliography

The bibliography is a page that contains information related to sources or references used in compiling material in electronic modules (e-modules). A bibliography is also provided to make it easier for users who want to check the validity of the material contained in the electronic module (e-module). The following is a display of the bibliography.

**E-modul Quantum Learning**

**Daftar Pustaka**

Kemdikbud. 2021. Buku Peserta Didik Ilmu Pengetahuan Alam SMP Kelas 7 Semester 2. Jakarta: Pusat Kurikulum dan Perbukuan, Balitbang.

Nugraheny, Y. T. 2020. Ringkasan Materi dan Latihan Soal IPA Kelas VII SMP/MTs. Jakarta: Bhuana Ilmu Populer.

Purwanto dan R. Susanto. 2022. Mengenal Sistem Tata Surya. Bandung: Kiblat Buku Utama.

Wardhani, S. P. R. 2020. Smart Bio Series: IPA BIOLOGI SMP/MTs Kelas 7, 8, 9. Yogyakarta: Diandra Kreatif.

Widodo, Wahono, Fida Rachmadiarti, dan Siti Nurul Hidayati. 2017. Ilmu Pengetahuan Alam untuk SMP/MTs Kelas VII Semester 1. Jakarta 1: Pusat Perbukuan Departemen Pendidikan Nasional.

Kelas VII SMP

Figure 7. Library View

8) Author Profile Page

On this profile page there is biodata about the developer of Quantum Learning-based electronic modules (e-modules) in class VII middle school class VII classification of living things. The profile page displays as follows:

**E-modul Quantum Learning**

**Profil Penyusun**

**Mellia Luana Putri** biasa di panggil (Luana) lahir di Lunang, 19 Januari 1999. Lunang terletak di Kabupaten Pesisir Selatan, Provinsi Sumatera Barat. Tumbuh dan besar di Lunang, Berjajah SD 06 Tanjung Beringin, SMP Negeri 01 Lunang, dan SMA Negeri 01 Paman, 01 Pendidikan IPA Universitas Negeri Padang angkatan 2017. Anak pertama dari 2 bersaudara. Menamatkan mahasiswa Pascasarjana Universitas Negeri Padang jurusan Teknologi Pendidikan angkatan 2021. Sekarang diarahkan menjadi Seneng Modul Elektronik (E-Modul) Berbasis Quantum Learning pada Materi Klasifikasi Makhluk Hidup Kelas VII dapat bermanfaat bagi pembaca.

Kelas VII SMP

Figure 8. Author Profile Display

*Development Stage (Development)*

*Validity test*

1) Media validity

A media expert validity test was carried out with Padang State postgraduate lecturers Universities that specialize in media. At this time stage, the researcher shows the media that has been created then media experts provide suggestions and comment. Media expert results. The assessment is presented in Table 2.

**Table 2.** Media Validator Assessment Results

Aspect	Validity Score	Category
Media Component Completeness	0.75	Valid
Media Content Suitability	0.75	Valid
Interface	0.75	Valid
Interactivity	0.75	Valid
Technology	0.75	Valid
Average value V	0.75	Valid
Percentage	75%	Valid

2) Validation of material experts

The material validation stage was obtained from one material expert by providing an assessment questionnaire, namely a Lecturer in the Biology Department, Padang State University. The assessment results include content component criteria, content components, language, presentation and graphics. The results of the material validator assessment can be seen in Table 3.

**Tabel 3.** Material Validator Assessment Results

Aspect	Validity Score	Category
Component Content	0.94	Valid
Language	0.79	Valid
Presentation	0.89	Valid
Graphics	0.96	Valid
Average value V	0.90	Valid
Percentage	89.7%	Valid

3) Language validity

The language validity stage was obtained from one language expert by providing an assessment questionnaire, namely a lecturer at the Department of Language and Literature Education, Padang State University. The assessment results include aspects of suitability for language, suitability for sentences, and suitability for students. The results of the language validator assessment can be seen in Table 4.

**Table 4.** Language validity Result

Aspect	Validity Score	Category
Conformity to Language Rules	1	Valid
Sentence Conformity	1	Valid
Suitability for Students	0.90	Valid
Average value V	0.97	Valid
Percentage	96.7%	Valid

*Practicality test*

1) Educator (Teacher) Practicality Test

The results of the practicality test assessment of educators (teachers) from 1 educator regarding electronic modules (e-modules) were reviewed from the criteria a) Ease of Use, namely 80%, b) Learning Time Efficiency, namely 80%, and 3) Benefits, namely 77%. Overall, the practicality test of educators (teachers) on Quantum Learning-based electronic modules (e-modules) is said to be "Practical" for use by students studying science subjects on the classification of living things.

2) Small Group Practicality Test

The results of the small group practicality test assessment of 6 students for electronic modules (e-modules) were reviewed from the criteria a) Ease of Use, namely 80%, b) Learning Time Efficiency, namely 80%, and 3) Benefits, namely 77.2%. Overall, the small group practicality test of the Quantum Learning-based electronic module (e-module) was said to be "practical" for use by students studying science subjects on the classification of living things.

*Implementation Stage*

The implementation stage is carried out after the media has been created and improvements (revisions) have been carried out by experts (validators). The research was carried out in August-September 2023 with 31 students in class VII of SMP Negeri 16 Padang using a pre-test and post-test, that is, before the trial was carried out in class VII of SMP, students took a test (pre-test) to see the level of students' initial knowledge of science subjects regarding the classification of living things. Then students carry out learning activities using electronic modules (e-modules) based on Quantum Learning. After students have studied science material on the classification of living things with an electronic module (e-module) based on Quantum Learning, then a test (post-test) is carried out to see the final score of the student's test (post-test) to find out about the electronic module (e-module). The electronic module (e-module) based on Quantum Learning can adjust students' level of understanding.



*Evaluation Stage (Evaluation)*

At the evaluation stage, the product design that has been developed is implemented in actual conditions or real situations in the classroom. The products produced by electronic modules (e-modules) have been declared feasible by experts and tested (practicality) on educators (teachers) and several students in classroom learning activities, then students assess the electronic modules (e-modules) to determine their feasibility. Electronic modules (e-modules) when used by users and user responses after using electronic modules (e-modules) in learning. The results of the assessment and student responses are followed up at the evaluation stage.

a. Large Group Practicality Test

In the practicality test, the evaluation phase will be carried out in August-September 2023. At this stage, researchers introduce and provide direction regarding electronic modules (e-modules) to educators (teachers), then introduce electronic modules (e-modules) to students. Next, the researchers tested the practicality and effectiveness of the electronic module (e-module). This research data was obtained from a questionnaire of student respondents as a practical matter in the learning process. The product is an electronic module (e-module) which has been validated by experts and then implemented experimentally (trial) on 31 class VII student respondents at SMP Negeri 16 Padang. The practicality test results of electronic modules (e-modules) based on Quantum Learning can be seen in Table 5.

**Table 5.** Large Group Practicality Test Result

Aspect Criteria Variable	Percentage %	Category
Ease of use	82	Very Practical
Efficiency	85	Very Practical
Benefits	81	Very Practical
Practicality Test Average	82%	Very Practical

Practicality test assessment from 31 students for electronic modules (e-modules) in terms of criteria: a) Ease of Use: 82%, b) Learning Time Efficiency: 85%, and c) Benefits: 81%. Overall, the practicality test of students on the electronic module (e-module) based on Quantum Learning was said to be "Very Practical" for use by students in science subjects regarding the classification of living things.

b. Effectiveness test

This effectiveness test begins with a pre-test which is tested on students who have not yet studied material for the classification of living things without using e-modules. This aims to get to know students understanding/knowledge of the material classification of living things. After carrying out the initial test, then

the e-module was developed later given to students. After that, a post-test was carried out. This was done to determine the effect of using e-modules on students' knowledge of the material on the classification of living things. Pre-test and post-test data were analyzed using the t-test. Again complete data can be seen in the attachment. The steps for testing effectiveness using the t-test are as follows following:

a) Calculating the difference (d)

$$d = \text{post test score} - \text{pre test score}$$

b) Calculates the mean difference

$$Md = \frac{\sum d}{N}$$

$$= \frac{1614}{31}$$

$$Md = 52,06$$

c) Calculating using the t formula:

$$t = \frac{\frac{Md}{\sqrt{\frac{\sum d^2}{N(N-1)}}}}{\frac{52,06}{\sqrt{\frac{9640,61}{31(31-1)}}}}$$

$$t = \frac{52,06}{3,22}$$

$$t = 16,17$$

Based on the results of the effectiveness test one-module products obtained a t-count of 9.86. Then look for the t-table value with df = N-1 = 31-1 = 30 with α 0.05, then t table (16.17 > 1.697). So it can be concluded that there are significant differences pre-test and post-test results. Thus, electronic modules (e-modules) based on Quantum Learning are "effective" teaching materials used for science subjects on the Classification of Living Creatures.

The product of teaching materials for the classification of living things is to create learning media in the form of electronic modules (e-modules). The media options are: because it can contain learning videos, animations, images and audio. Apart from selecting learning media, determining the right learning model is also an important thing to understand. The Quantum Learning Model is tips, instructions, strategies, and the entire learning process that can sharpen understanding and memory, and make learning a fun and rewarding process. From opinions about Quantum Learning, Quantum learning conditions students to feel comfortable and happy in the learning process (Pono, 2016).



### 1) Validity of Quantum Learning Based E-Modules

According to (Anggraini et al., 2017) a product or learning media can be used in the learning process if it has valid criteria. Validity can be interpreted as the learning media or product developed being valid or suitable for use before being used in the learning process. According to Yusuf (2005) in (Putri et al., 2021) validity is a test to assess a product resulting from development research.

On the validity of the media using indicators from (Bozkurt and Bozkaya 2015) namely components, content, interface, interactivity, technology. Results of e-module media expert validator assessment based on Table 2 shows that the Aiken's V value for component aspect of 0.75 with a valid category with a percentage of 75%. This shows that the e-module components being developed are complete, clear and systematically arranged. That the interactivity aspect obtained a value of 0.75 in the valid category and its constituent components can create interactions within the learning process. The feasibility of this interactivity aspects according to (Wijaya 2011).

The next validity test is the material validity test, The assessment aspect consists of four aspects, namely suitability of content, linguistic components, presentation components and graphic components. That assessment of e-module feasibility aspects content, Aiken's V classification of living things on content component, is 0.90 with a percentage of 89.7% in the valid category. The value of the V Aiken electronic module is based on Quantum Learning. This shows that the component aspects of the content includes the suitability of the material contained therein e-module with CP, ATP, flow of learning objectives (ATP) to be achieved and material provided according to ability (Rochmad 2012).

This linguist's validation assessment is based on predetermined aspects, namely aspects of conformity to language rules, suitability of sentences, and suitability to students. Based on the results of the linguist validation analysis, an average of 0.97 was obtained with a percentage of 96.7% in the valid category. Based on Table 3 validator assessment produces Aiken's V of 0.95 in valid conditions, shows that the electronic module (e-module) based on Quantum Learning applies well, the Indonesian language rules are straightforward and clear so that it is easy for e-module users to understand. According to the Ministry of Education and Culture (Kemendikbud 2017), a good e-module must be used easy to understand language and common words making it user friendly.

The e-module layout is neatly arranged according to the Quantum Learning model syntax, and the design and colors used are attractive. Macroscopic representations used have been adapted

(Chittleborough and Treagust 2007) so that observations at the macroscopic level can go through everyday experiences.

### 2) Practicality of Electronic Modules (E-modules) Based on Quantum Learning

The practicality test showed that the practicality test assessment of 31 students for the electronic module (e-module) reviewed was 4.08 with the criteria aspects a) Ease of Use: 82%, b) Learning Time Efficiency: 85%, and c) Benefits: 81% means that the electronic module (e-module) based on Quantum Learning material on the classification of living things is very practical to use in the learning process. This simplicity of use is related to clear e-module language (Amali et al., 2019). This was also expressed by (Topano et al., 2022) who stated that learning media that is easy to use will provide a positive response to the learning process and can achieve the expected learning objectives.

### 3) Test the Effectiveness of Electronic Modules (E-Modules) Based on Quantum Learning

Effectiveness itself has the meaning of something a benchmark for the success of an organization or work in achieving goals as a result of the impact of something implementation of activities or work (Naufal Dzakwan et al., 2021). It can be said that the effectiveness test is a feasibility test of a product so that later the product can be used effectively comprehensive and broader (Hafsah et al., 2016) in (Naufal Dzakwan et al., 2021). Test the effectiveness of Quantum Learning-based electronic modules (e-modules) using pre-test and post-test. Pre-test carried out on students who have not used electronic modules (e-modules). Meanwhile, the post-test was carried out on students whose learning used electronic modules (e-modules) based on Quantum Learning. The results of the effectiveness test obtained a tcount of 16.17. Next, look for the t-table value with  $df = N-1 = 31-1 = 30$  with  $\alpha 0.05$  so that the t-table is 1.697. So it is known that tcount is greater than ttable ( $16.17 > 1.697$ ).

From the results of these calculations it can be concluded that there is a significant difference in the results of the pre-test and post-test. Thus, electronic modules (e-modules) based on Quantum Learning are learning media, namely teaching materials that are effectively used for science subjects on the classification of living things. This is different from research by Laila Rahmi, 2023 with the title "Development of Science E-Modules by Integrating Quantum Learning to Improve Students' Understanding of Concepts and Creative Thinking" stating that Based on the research results, the validity value of MPK Science E-Modules is integrated with Science to improve conceptual understanding and thinking. student creativity, namely 90.4, is in the very good category.

According to the teacher, the practicality value of the Science Integrated MPK E-Module is 92.08 in the very good category. The integrated MPK value for the E-Module science practicum according to students is 80.69 in the good category. Thus, it can be concluded that MPK integrates the Science E-Module to improve conceptual understanding and creative thinking that is valid and practical. Wina Sanjaya (2014) in (Ibrahim et al., 2023) states that the learning media used must pay attention to the effectiveness of its use. This is different from research by Rezeki Mitra Sari, 2019 with the title "Development of Science Worksheets Oriented to Quantum Learning Models on Simple Plane Material, Plant Structure, and the Digestive System for Class VII Middle School Students" explaining that the science LKS oriented to Quantum learning models that were created are in the category Very high validity with an average value of 86.12. The use of science worksheets oriented towards Quantum learning models is practical according to teachers and students with very high criteria based on averages of 89.84 and 81.63 respectively.

The use of science worksheets oriented towards the Quantum learning model is effective in increasing students' knowledge, attitudes and skills competencies. And the research entitled "Development of E-modules Based on Quantum Learning in Science Subjects for Class VII SMP" is different from previous research because there is a novelty in this research, there are audio, images and learning videos related to material that supports the learning process. Apart from that, there is feedback for students when working on assignments, exercises and direct evaluations on this Quantum Learning-based E-module so that it can support students' independent learning.

## Conclusion

Based on the research conducted, it can be concluded as follows. Electronic Module (E-module) based on Quantum Learning in the science subject Classification of Living Creatures material for class VII has completed research and development using the ADDIE development model. Electronic Module (E-module) based on Quantum Learning in science subjects Classification of Living Creatures material for class VII which has been developed has a high level of validity, very practical practicality, and high effectiveness on student learning outcomes. Effectiveness of Electronic Modules (E-modules) based on Quantum Learning in science subjects, Classification of Living Creatures material for class VII, The product shows a significance value of 16.17 which means it influences student learning outcomes.

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## Author Contributions

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## Conflicts of Interest

The authors declare no conflict of interest.

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