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Development of Tecton Edu Web-Based Learning Media on Ipas Earth Plate Material for Grade V at SDN Rambutan 03 Pagi

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A B S T R A C T

Education is essential for a country's progress, including Indonesia. To support the growth of essential student competencies, the Independent Curriculum integrates science and social studies into a unified subject called IPAS. However, observations at SDN Rambutan 03 Pagi revealed that IPAS learning particularly the topic of Earth Plates remains difficult for students to grasp due to conventional and less interactive teaching methods. To tackle this problem, the study seeks to create a website-based learning tool named Tecton Edu, which is developed following the TPACK framework and incorporates the 4C approach (Critical Thinking, Communication, Collaboration, and Creativity). The study employs a Research and Development (R&D) method using the ADDIE model, consisting of five phases: Analysis, Design, Development, Implementation, and Evaluation. Data were collected through observation, interviews, and questionnaires, then analyzed using both qualitative and quantitative techniques. The validation results indicated that the media was rated as highly feasible by media experts (87%), material experts (86%), and IT experts (95%). Educators gave a 100% "very feasible" rating, while student responses from small group trials reached 85%, and large group trials 94%, both in the “very feasible” category. Therefore, Tecton Edu is considered highly suitable for use in fifth-grade science learning.

1. Introduction

Education is the key to improving the quality of life in Indonesia, one of the developing Asian countries. In the Independent Curriculum, science and social studies subjects are no longer taught separately, but are united into one new subject called IPAS (Natural and Social Sciences). The main purpose of this merger is to support the development of essential skills for students, both for current and future learning needs (Rahmawati et al., 2023). In addition, this integrative approach also aims to ensure that the learning process can continue consistently at each level of education (Zakarina et al., 2024).

According to Agustina in (Darniyanti et al., 2023), Professional educators, especially in science subjects, need innovation in learning media. The objectives of IPAS learning include fostering curiosity, understanding oneself and one's environment, inquiry skills, active engagement, and understanding of IPAS concepts. To achieve this goal, educators must learn to create the learning media necessary to participate in the learning process. This is in line with Gagane and Briggs (1974), Learning media is a tool used to convey lessons and encourage students to follow the learning process (Mayangsari et al., 2024). There are three categories of learning media. First, audio media, which is perceived through the sense of hearing, such as tapes and radios. Second, visual media, which is absorbed through the sense of sight, such as still or moving images. Third, audiovisual media, which is a combination of sound elements and visual displays, capable of stimulating both senses simultaneously (Fitri et al., 2024). In the world of Education, educators must also prepare themselves to improve the quality of their competencies by focusing on more advanced technology integration, especially within the framework of TPACK (Technological Pedagogical Content Knowledge) (Putra et al., 2023). Therefore, the development of learning media that prioritizes the 4C approach (Critical Thinking, Communication, Collaboration, dan Creativity), increasingly needed to overcome various challenges.

Technology plays a crucial role in supporting the learning process, serving both as a tool for independent learning and as a complement to other teaching methods, such as blended learning or hybrid learning (Novela et al., 2024). Technological advances allow flexible, creative learning beyond classrooms, with educators encouraged to develop interactive media like websites. According to Kuswanto in (Mulder et al., 2023), web-based learning provides students with unlimited learning space. Through engaging information, interactive materials, and attractive content, it can transform the way students learn and increase their motivation. Based on the Digital-Based Learning media Book (Hendra et al., 2023), Currently, digital-based learning is increasingly used by various groups. Digital technology is a modern learning medium that allows Students access information faster and more efficiently. By utilizing this media, educators are able to enhance the learning process, making it more engaging, interactive, and relevant to current trends. This is in line with the research that has been carried out by (Hastuti & Ghoni, 2022), that the completeness of learning Students increased from 33.3% to 93.3% after the application of website-based learning media in solar system materials. And In line with Shofi and Septiani (2024), that learning media based on *Website* has the value of the practicality of educators in providing learning materials for students (Septiani & Shofi, 2024). In addition, research conducted by Ismi and Abdul (2023) shows that learning platforms that use web-based media show effectiveness in improving learning achievement Students. and encourage an increase in their learning completeness (Hastuti & Ghoni, 2022).

According to the findings from observations and interviews with the principal and one class V educator that has been carried out at SDN Rambutan 03 Pagi, this school has used an independent curriculum in all classes. Educators have begun to use information and communication technology as a medium in delivering materials, such as through the use of learning videos from youtube. However, the utilization

has not been carried out optimally and is still limited to certain types of media. In some cases, the delivery of material still depends on package books and lecture methods without supporting visualizations, so the material delivered tends to be abstract and conventional.

The next problem that the researcher found in the observation of class V of SDN Rambutan 03 Pagi was that students had difficulty understanding the material, lacked enthusiasm for learning and the learning media used was less innovative and interactive, especially in the earth plate material, students got learning results that did not meet the learning outcomes and objectives. This is because educators only use lecture methods and learning videos from youtube without other supporting media. Of course, this condition has an influence on the learning process of students.

Based on the problems that have been identified, it is necessary to develop learning media that is interesting and relevant to the material presented, with reference to the TPACK (Technological Pedagogical Content Knowledge) framework. This approach is relevant in science learning because it supports the strengthening of 21st century competencies, namely the 4C (Critical Thinking, Communication, Collaboration, and Creativity) in meeting learning outcomes and objectives. One effective way to make efforts in interesting IPAS material is to create a Website-based learning media. This website was selected as a medium because it helps students grasp materials that are often challenging for them to comprehend. In addition, the learning process can also be carried out not only in the school environment, but also in various places and flexible times, so that educators can also provide wide learning access to students and form students' independence and curiosity in learning. Based on the above background, this research is focused on the Development of Website-Based *Tecton Edu* Learning media on Class V Earth Plate IPAS Material at SDN Rambutan 03 Pagi. *Tecton Edu* learning media was designed by researchers by utilizing technological sophistication in the form of *a* website that displays learning materials, real-time movement of tectonic plates and online quizzes to test students' understanding of the earth's plates.

2. Methodology

This research applies Research and Development (R&D) methods, which aim to design or improve a product and test its effectiveness. This research begins with the research stage to collect information about user needs, and then enters the development stage to produce certain products or media in the implementation of this research (Gustina et al., 2024). The researcher applies the ADDIE development model which consists of five stages, namely: (1) *Analysis* (2) *Design* (3) *Development* (4) *Implementation* (5) *Evaluation.* This model prioritizes a systematic learning process, and each step performs a different task. This includes analyzing students' needs, selecting learning methods and resources, developing products, and evaluating or improving (Rustandi & Rismayanti, 2021).

This research combines two approaches, namely qualitative and quantitative. A qualitative approach is used to analyze data in the form of verbal descriptions obtained through interviews, evaluations, and suggestions from validators on the developed product. Meanwhile, a quantitative approach is used to process numerical data collected from the results of validation and dissemination of questionnaires to media experts, material experts, information technology experts, educators, and students through a trial process (Subhaktiyasa, 2024). Validity refers to the process of testing to ensure that the research design yields accurate and trustworthy data, with a validation questionnaire serving as the primary instrument. Therefore, validity testing plays a crucial role in determining the credibility of the research outcomes (Oktariyanti et al., 2021). The data collection instruments were in the form of validation questionnaires and response questionnaires, which were compiled using a five-point Likert scale in *a checklist format.* The data collected from the validation process and respondents' responses were then analyzed using the following formula:

$$Total\ average\ results = \frac{Total\ score}{Number\ of\ test\ items}\ x\ 100\%$$

Source: (Herlambang, 2023)

Based on calculations using the previously explained formula, the feasibility percentage of Tecton Edu learning media was obtained after validation by media, material, and IT experts. This validation process includes aspects of general appearance, specific appearance, media presentation, material, learning materials, appearance (visual/design) and Functionality (Interactivity and Performance). The assessments provided by the validators were described to identify the feasibility level of the developed learning media. The percentage scores obtained served as indicators that the media had fulfilled the required feasibility standards and was ready for use in learning activities. Information related to the percentage and feasibility level is presented in Table 1.

Table 1. Eligibility Scale

Achievement Rate (%)	Category
81%-100%	Very Feasible
61%-80%	Feasible
41%-60%	Enough
21%-40%	Less Feasible
0%-20%	Not feasible

Source : Modified from (Sari & Dwi, 2022)

After the validation process of the feasibility of *Tecton Edu* media is carried out, the researcher determines the feasibility level of the developed media based on the results of the evaluation of experts who act as validators. This assessment is also strengthened by the percentage of responses from educators and students. The percentage and level of product feasibility are presented in Tabel 2.

Table 2. Eligibility Scale

Achievement Rate (%)	Category
81%-100%	Very Feasible
61%-80%	Feasible
41%-60%	Enough
21%-40%	Less Feasible
0%-20%	Not feasible

Source : (Pratiwi et al., 2022)

3. Results and Discussion

Result

This study uses a Research and Development approach with reference to the ADDIE model, which consists of five main stages, namely: (1) *Analysis* (2) *Design* (3) *Development* (4) *Implementation* (5) *Evaluation*. The following are the stages of development carried out:

1) Analysis

The analysis stage in the development of *Tecton Edu* media includes four main aspects. First, the analysis of needs and characteristics was carried out through observation at SDN Rambutan 03 Pagi. Students show difficulties in understanding the material about the Earth Plate, which is caused by the nature of the material that tends to be abstract and the use of less interactive learning media. This condition results in a decrease in students' interest in learning and achievement of learning outcomes. Because effective learning media can encourage increased learning motivation while deepening students' conceptual understanding (Darlianti et al., 2025). Therefore, more interesting and easy-to-understand learning media innovations are needed to increase learning effectiveness. Second, the material analysis is carried out by referring to the Independent Curriculum Teaching Module. The indicators that are a reference for the development of matter are demonstrating the earth's layers, explaining the motion of the plates, and telling the convection current. Third, media creation analysis, in which the learning media is developed using a website. This is supported by previous research (Hidayat et al., 2024), which shows that digital-based learning media helps activate students' procedural skills and stimulates their interest and motivation in learning. This analysis includes the use of the Articulate Storyline application to convert PowerPoint material into HTML5 format so that it can be accessed interactively through *the Website*. Canva and SketchUp applications are also used to strengthen the visual appearance to match the character of IPAS learning class V. Fourth, the specification analysis explains that the *Tecton Edu* learning media is designed as an interactive website with a design that supports active student engagement. The specifications include:

a. Product Type : Website *Tecton Edu*
b. Media Type : Interactive
c. Type of Writing : Roboto, Baloo, Poppins, Adigiana Toybox, Negrita Pro

d. Warna : Full color.

2) Design
The design of Tecton Edu's Website-based learning media is carried out through several stages. First, the study of the material and questions was carried out by choosing the topic of the Earth Plate from the science class V subject, based on the results of observations, it can be seen that many students have difficulty understanding the concept. These media are designed to be interactive, contextual, and accessible at any time, thus supporting self-paced learning. The questions included the layers of the earth, the earth's plates, surface changes, and plate shifts. Second, the creation of flowcharts is compiled to map the media workflow so that the development process is more systematic and structured. Third, product design is carried out by creating media elements that support learning, such as logo design and website display, visual materials from PowerPoint, 3D drawings using SketchUp, and interactive quizzes. All of these elements are designed to be easily accessible, interesting, and able to improve students' understanding of the Earth Plate material as a whole.

3) Development
At the development stage, the researcher develops *Tecton Edu* learning media, based on the flowchart that has been created and the design of *Tecton Edu* products, then the development stages are carried out as follows:
a. Prepare the Articulate Storyline application as a PPT media converter, so that it can change the appearance of HTML5 that will be displayed on a website.
b. When the Articulate Storyline application has been imported or changed to a story, then a few additional configurations are needed such as sounds, animations and others.
c. After the configuration is complete, it is then saved in the Articulate Storyline application into a story and made into an html5 file that will be deployed to the public.
d. Set up a hosting website and domain to deploy a design or Articulate Storyline that has been created for the public to see.
e. Upload the file that has been converted to html5, then upload it to a hosting that the author owns and the domain that the author has.
f. Before it is seen by the public, first zip the file and extract it on a hosted server.
g. The website interface functions properly and is accessible to the public, making it ready to be utilized as a learning medium for students.

The appearance of the *Tecton Edu* Website is as follows:

Picture 1. Login page display

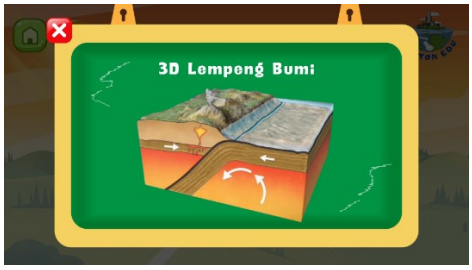
Picture 2. Main page display

Picture 3. Material Guide View

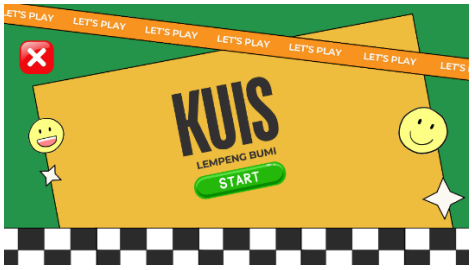
Picture 4. Display Usage information

Picture 5. Material List view

Picture 6. 3D view of Earth's Layers



Picture 7. 3D view of Earth's Plates



Picture 8. Material quiz display

Website-based Tecton Edu learning media designed to develop IPAS learning media can be accessed through the https://tectonedu.url-s.me/. The next stage after media design is a validation process involving three experts: media experts, material experts, and IT experts. This process is carried out through the distribution of assessment questionnaires to validators, as well as the presentation of Website-based learning media, namely Tecton Edu, as material for study and evaluation. The evaluation outcomes from the three experts are presented in Tables 3, 4, and 5. Based on the feasibility evaluation data by media experts, the media assessment took into account three factors. The general appearance aspect scored 80%, categorizing it as " feasible ". The specific appearance aspect scored 88%, categorizing it as

"very feasible." Meanwhile, the media presentation aspect scored the highest at 92%, also categorizing it as "very feasible." Of these three aspects, the overall average score from the media expert validators was 87%, categorizing it as "very feasible," as shown in Table 3 and Figure 9.

Table 3. Media Expert Validation Test Data

Aspects	Achievement Rate (%)	Category
General Appearance	80%	Feasible
Custom Display	88%	Very Feasible
Media Presentation	92%	Very Feasible
Average	**87%**	Very Feasible

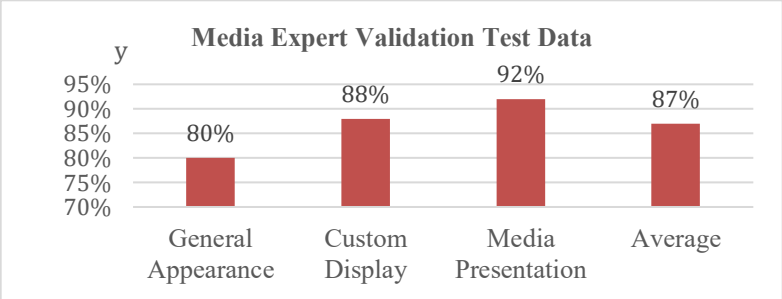


Figure 9. Media Expert Validation Test Data

Based on the feasibility evaluation data by material experts, the material assessment took into account two factors. The material aspect scored 87%, which is categorized as very feasible. Meanwhile, the learning materials aspect scored 85%, which is also categorized as very feasible. The average score for both aspects, according to the material experts' assessment, was 86%, which is categorized as very feasible, as shown in Table 4 and Figure 10.

Table 4. Material Expert Validation Test Data

Aspects	Achievement Rate (%)	Category
Material	87%	Very Feasible
Learning Materials	85%	Very Feasible
Average	**86%**	Very Feasible

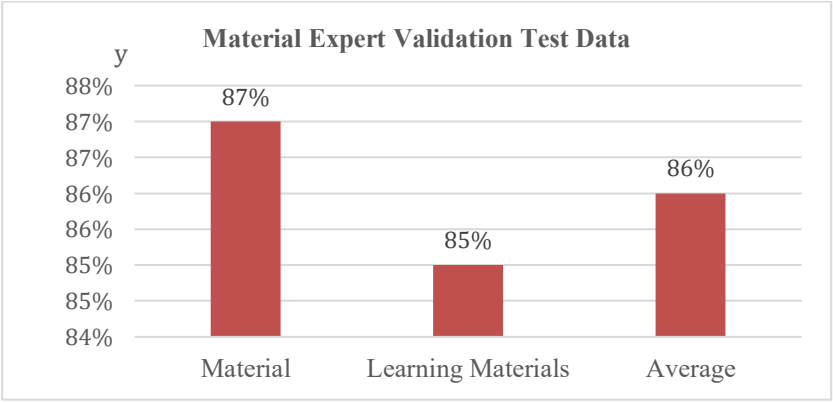


Figure 10. Material Expert Validation Test Data

Based on the feasibility evaluation data by IT experts, the media assessment took two factors into account. The Appearance (Visual/Design) aspect achieved a score of 96%, categorized as very feasible. The Functionality (Interactivity and Performance) aspect achieved a score of 94%, categorized as very feasible. Based on this data, the average percentage obtained from the IT expert validator's results can be calculated at 95%, categorized as very feasible. As shown in Table 5 and Figure 11.

Table 5. IT Expert Validation Test Data

Aspects	Achievement Rate (%)	Category
Display (Visual/Design)	96%	Very Feasible
Functionality (Interactivity and Performance)	94%	Very Feasible
Average	**95%**	Very Feasible

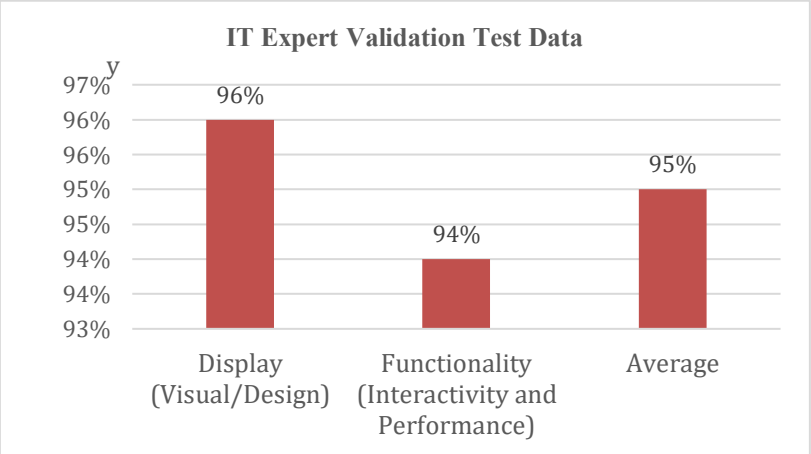


Figure 11. IT Expert Validation Test Data

4) Implementation

The implementation stage was carried out at SDN Rambutan 03 Pagi by implementing it to educators and students. After receiving responses from educators, the Tecton Edu learning media was tested for students through two stages of implementation, namely small groups on May 15, 2025 and large groups on May 16, 2025. This implementation stage uses a questionnaire with research on a likert scale of one to 5. In implementing this learning media, educators and students access the *Tecton Edu* Website link, which is https://tectonedu.url-s.me/ through a mobile phone, laptop or tab with an active internet state. After using all learning media, students fill out an assessment questionnaire for *Tecton Edu*-based learning media. The following are the responses of educators (homeroom teachers) and the results of student trials.

Based on the results of the calculation of educators' response assessments to the website-based Tecton Edu learning media, this assessment took into account three factors. The material aspect scored 100% and was categorized as very feasible. Similarly, the learning aspect scored 100% and was

categorized as very feasible. The media aspect also scored the same percentage, namely 100% and was categorized as very feasible. Based on these data, it can be concluded that the average assessment given by educators to the website-based Tecton Edu learning media was 100%, classified as very feasible. As shown in Table 6 and Figure 12.

Table 6. Educator Response Assessment Data

Aspects	Achievement Rate (%)	Category
Material	100%	Very Feasible
Learning	100%	Very Feasible
Media	100%	Very Feasible
Average	**100%**	**Very Feasible**

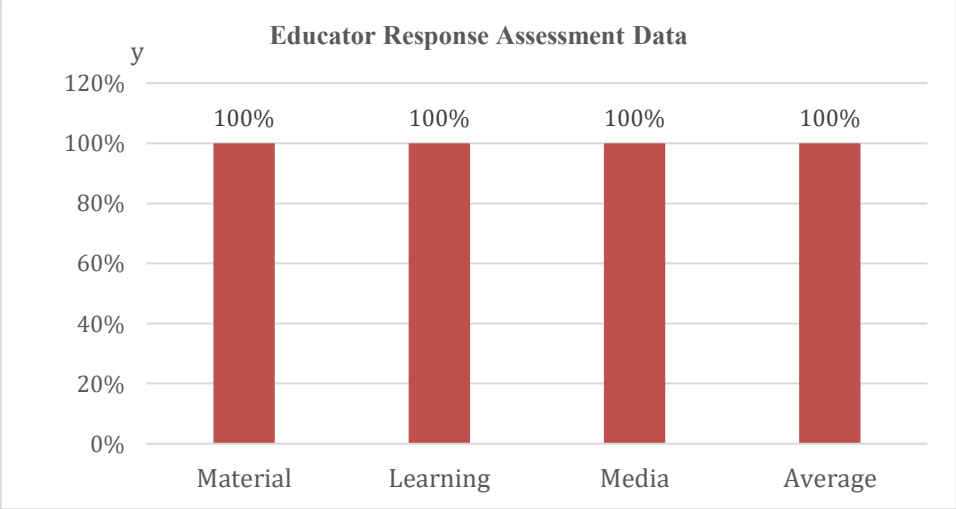


Figure 12. Educator Response Assessment Data

Based on the results of a small group trial conducted in class 5D with 13 students, this assessment took into account two factors. The learning aspect received a percentage of 84% and was categorized as very appropriate. The media component received a score of 87%, which falls within the very feasible category. Additionally, the average student evaluation during the small group trial of the Tecton Edu website-based learning media reached 85%, also placing it in the very feasible category. As shown in Table 7 and Figure 13.

Table 7. Small Group Trial Assessment Data

Aspects	Achievement Rate (%)	Category
Learning	84%	Very Feasible
Media	87%	Very Feasible
Average	**85%**	**Very Feasible**

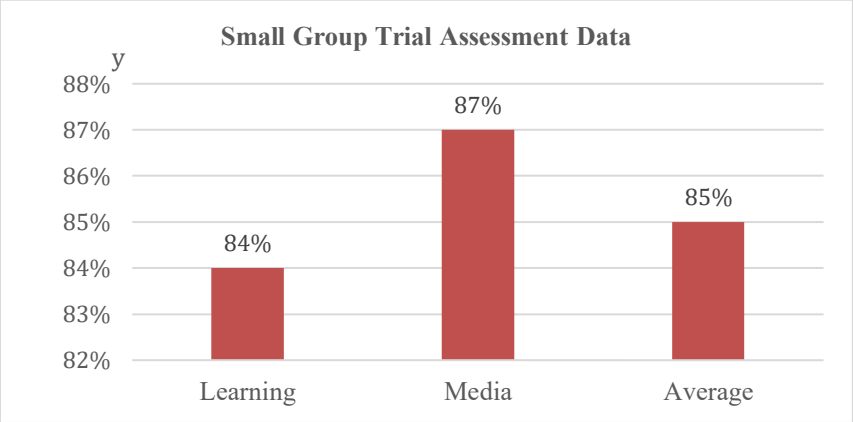


Figure 13. Small Group Trial Assessment Data

The large-group trial, conducted on all 5C students, assessed two main components. The results showed that the learning aspect scored 94%, categorized as very feasible. The media aspect also scored the same percentage, 94%, and was categorized as very feasible. Based on these data, the average student rating for the Tecton Edu website-based learning media reached 94%, categorized as very feasible. As seen in Table 8 and Figure 14.

Table 8. Large Group Trial Assessment Data

Aspects	Achievement Rate (%)	Category
Learning	94%	Very Feasible
Media	94%	Very Feasible
Average	**94%**	**Very Feasible**

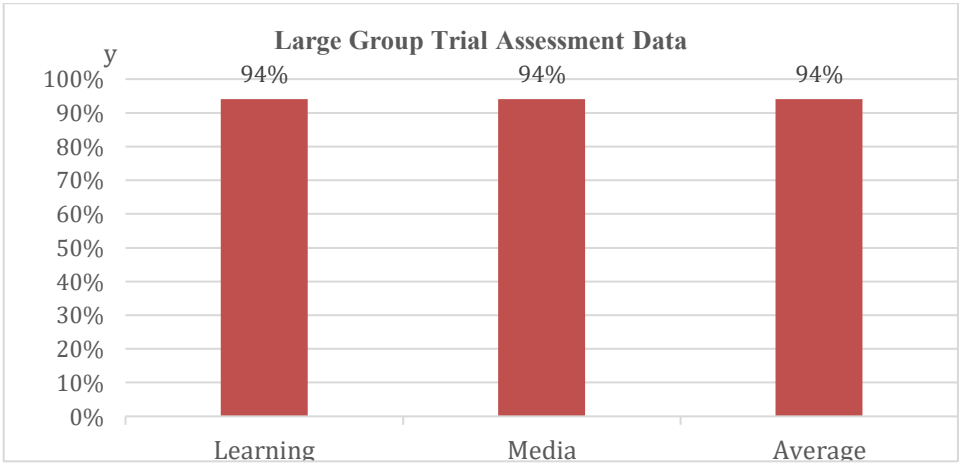


Figure 14. Large Group Trial Assessment Data

5) Evaluation

This evaluation stage is carried out after data is obtained from the results of media, material and IT validation, as well as after receiving responses from educators and has been tested on students. After going through the validation process, a revision stage (if any) of the *Tecton Edu* learning media is carried out. After being validated with the "feasible" category, the

researcher can conduct research in the field. In this research process, evaluation is carried out when data is obtained from the results of small and large group trials, if it gets the category of "feasible" or "very feasible", there will be no revision or evaluation stage, and *the Tecton Edu* learning media can be applied by Class V elementary school students.

Discussion

In the process of developing learning media, the first step is to collect information from various related parties, especially educators or homeroom teachers. Data collection is carried out through direct field observation and structured interviews to obtain an overview of needs and problems in the ongoing learning process. The second stage is design, at this stage it begins with the study of materials and questions, the creation of flowcharts and the design of *Tecton Edu* learning media products. The third phase is the development stage, during which the learning media created in PowerPoint (PPT) and SketchUp is transformed into a website format, incorporating various interactive features for practical use. The fourth stage is the Implementation phase, during which the researcher carries out a validation process for the Tecton Edu learning media. This process involves media experts, material experts, and IT experts to evaluate the suitability and effectiveness of the developed media before it is trialed with students.

The validation results of *Tecton Edu* conducted by experts indicated high feasibility across different aspects. As shown in Table 3, the media expert evaluation reached 87% and was classified as very feasible. Meanwhile, the material expert validation, presented in Table 4, obtained a score of 86% and also fell into the very feasible category. Furthermore, the IT expert validation, outlined in Table 5, achieved the highest score of 95%, which likewise placed it in the very feasible category.The implementation stage was also carried out for educators and students of SDN Rambutan 03 Pagi. The response of educators to the *Tecton Edu* Website-based learning media is found in table 6, which is 100% with a very feasible category. And the results of the trial for small groups are in table 7, which is 85% with the very feasible category and the overall average percentage of the results of the large group test, which is 94% with the very feasible category. The fifth stage is evaluation, after the feasibility of the media has been validated by experts and the assessment is carried out by educators and tested on students, *Tecton Edu* learning media has a very decent title so that the evaluation stage is not carried out and *Tecton Edu* learning media can be applied to class V students.

4. Conclusion

Based on the research and development conducted, the Tecton Edu website-based learning media for the Earth's Plate topic in Science, developed using the ADDIE model, was successfully created and fulfilled the required feasibility standards. The validation assessments conducted by material experts, media experts, IT experts, and educators (homeroom teachers) consistently categorized the Tecton Edu website-based learning media as very feasible. This consistent result across

different fields of expertise demonstrates that the developed media meets the required standards of quality, functionality, and relevance, making it highly suitable to be implemented in the learning process. The Tecton Edu website-based learning media that was developed has demonstrated its effectiveness in enhancing student engagement during the learning process, as reflected in their active involvement, higher enthusiasm, and improved comprehension of the material. This is evident from the outcomes of both the small group and large group trials, which were assessed as highly feasible. Therefore, based on the process of developing the Tecton Edu Website-based learning media, it has met the requirements and is suitable to be used as a tool in the learning process.

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