DEVELOPMENT OF ADOBE FLASH CS6-BASED LEARNING MEDIA ON ARTHROPODE MATERIALS

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ABSTRACT

This study aims to develop learning media based on Adobe Flash CS6 on Arthropod material and produce appropriate learning media based on the assessments of material experts, media experts, and students. This research applies a 4-D development model using. Each learning media validator consists of two material experts and two media experts. The small group trial subjects were 26 biology students, while the significant group trial subjects were 78 biology education students. The research data was obtained from a questionnaire on the feasibility of learning media from material experts, media experts, and student response questionnaires. The data obtained were analyzed by descriptive analysis techniques. The results showed that the validation of material experts and media experts obtained an average value of 97.5 and 102.5, respectively, in the very feasible category. The small group trial and large group trial results obtained an average value of 93 and 104.1, respectively, in the very feasible category. The resulting learning media is declared valid and very suitable to be used as a learning medium for biology students at the State University of Medan on Arthropoda material.

How to Cite:

INTRODUCTION

Learning media are objects that can be seen and heard in the classroom and outside the classroom, which are used as a connecting tool (communication media) in teaching and learning interactions (Permadi, 2016). Learning media is one of the intermediaries used to convey messages from the sender to the recipient of the message. In education, learning media is known as an intermediary tool used to convey information conveyed by lecturers to students so that learning objectives are achieved. The word media comes from Latin, intermediary, or introduction (Arsyad, 2002). Learning media serves as a tool in teaching and learning activities, namely providing visual experiences to encourage learning motivation, clarify, and facilitate abstract concepts (Fatturahman, 2007). In addition to improving the learning process, learning media have a significant role and influence the achievement of the learning objectives that have been set (Hardianto, 2005).

The lecture process requires students to understand several indicators and learning objectives that have been set on various materials, including the Invertebrate Animal Taxonomy (THI) lecture material. Based on the THI 2020 Semester Learning Design (RPS) analysis results, the THI lecture contains eight sub-materials, one of which discusses the material for the Phylum Arthropoda. This sub-material contains indicators of student learning mastery achievement; namely, students can identify the Phylum Arthropoda based on general characteristics, specific characteristics, taxonomy, key determination, conservation status, and Arthropoda animals' role in daily life. Complex Arthropod material will be easier to learn if students directly observe the object of observation, namely by making observationsdirectly on various species of Arthropoda animals, besides that students are also easier to observe the characteristics and the classification of Arthropoda animals (Fakhrah, 2015).

The explanation of identification material is a concrete concept that can be sensed and known through direct observation. Even though it is concrete, the material can become abstract if students do not observe or see the object (Lepiyanto, 2016). In the material for the Phylum Arthropoda, there are concepts related to the identification. The material requires a good understanding of the concept. Explanation of material that is still verbal causes students to be unable to understand the material well. Students will more readily understand the material if it is presented with the help of learning media that contains pictures, animations, learning videos with explanations than if it is only explained orally or in text.

Various learning media exist in various forms of images, visuals, animations, but not all of them are optimally presented in learning. Learning media is very useful for Arthropoda material lectures if it is packaged, arranged, and arranged systematically and logically by referring to the indicators and learning objectives of the THI 2020 RPS into a simple, attractive Arthropoda learning media, meeting the demands of learning and helping lecturers and students in the learning process to achieve the learning objectives of Arthropods.

The utilization of learning media on Arthropod material can be designed according to the learning objectives set. Based on the THI 2020 RPS analysis, it was concluded that the Arthropoda material needed a learning media that could make Arthropoda material with a broad scope to be studied by students. Concrete material explanations can be displayed in video observations, animations, and pictures that help deliver Arthropod material to students through varied and creative learning media.

Based on the results of the initial analysis of 32 Biology education students in 2018 who have taken the THI course, information was obtained that in the THI lecture process, lecturers have used interactive learning media in the form of PowerPoint (PPT). According to students, in its application in learning, the learning media has not been used enough to study Arthropod material. In addition to low student interest in learning, THI courses are also considered difficult. Students have difficulty understanding the Arthropod material because the material is too broad, and there are many unfamiliar terms, which adds to the existing problems. The student's opinion is in line with the report's results by Margiyanti et al. (2018). According to students who have studied the Arthropod material, they are still confused in understanding scientific language and biological terms classification, the characteristics of each class. Without applying the concept, namely the identification of Arthropod animals, Arthropoda material is thought to make students trapped in a mindset that Arthropoda material is a challenging material to learn because it contains broad and challenging material. From the results of the initial analysis, it was concluded that students (100% of students) needed additional innovative learning media that could overcome the learning difficulties they faced and help them understand the Arthropod material.

From some of the things above, it is essential to have additional learning media according to the needs of students on Arthropod material. Based on the results of student analysis, information was obtained that students needed additional learning media that contained material and included learning videos, pictures, animations, sounds, evaluations, and a glossary. Learning media that follows the Arthropod material and contains the components needed by students is learning media in the form of multimedia so that the materials and components can be designed according to the demands of the THI RPS that have been set. Multimedia is a learning media that combines graphic, text, sound, video, and animation media. Interactive multimedia allows users to control what and when the desired multimedia elements will be displayed. One example of interactive multimedia is interactive learning media (Sari & Susanti, 2016).

Interactive learning media is an alternative learning media that can improve the quality of education, enabling students to learn independently and repeat material that is not clearly understood (Sari & Susanti, 2016). Developing interactive learning media can use Adobe Flash CS6 software. Adobe Flash CS6 is one of the flexible learning media development software, and some features support making interactive, creative, and innovative learning media (Supriyadi, 2016).

The advantages of interactive learning media are that it can provide a deeper understanding of the material being discussed, can explain complex concepts more efficiently, and can explain abstract material into concrete, attract and arouse interest, motivation, and creativity and the material that has been studied can be repeated, and so on (Munir, 2008).

The development of learning media is supported by facilities owned by students, namely smartphone or android devices. The learning media design developed is in the form of an android application. The selection of learning media based on this android application was based on findings when distributing student analysis questionnaires. It was obtained that 100% of students had their own smartphone devices with an average use of more than 12 hours per day to play social media, chat via WhatsApp, and study. It can be utilized by maximizing the use of smartphones for learning through android-based learning media that can be used anytime and anywhere.

The learning media developed can support the learning process and attract more students' attention and interest to learn because the media display is attractive and fulfills students' needs for learning media. It can help students more easily understand and achieve the learning objectives of the Arthropod material.

Like the previous research by Ufisyana and Pratama (2019), entitled the development of learning multimedia based on Adobe Flash, it produces learning multimedia products based on Adobe Flash for Information and Communication Technology (Tik) Subjects at Al-Ishlah Middle School, Semarang, which gives a pleasant effect so that students are not easily bored and easier to understand the material presented by the teacher. The results of the report of Hidayah et al. (2017) stated that Adobe Flash-based learning media is enjoyable to use as a more varied learning media to increase student motivation and improve student learning outcomes.

Based on this background, the author conducted a study entitled Development of Adobe Flash CS6-Based Learning Media on Arthropod Material. This learning media is expected to be able to provide information in the form of interactive Arthropoda material such as images, text, animation, audio, video and equipped with learning evaluations to measure student knowledge in studying Arthropod material and can be used as an alternative in classroom and distance learning activities.

METHOD

This research was conducted at the Department of Biology, Faculty of Mathematics and Natural Sciences, Medan State University. This research was conducted from November to December 2020. This type of research is research and development (Research & Development) or R&D. According to Havis (2013), development research methods are methods used to produce specific products and test the effectiveness of these products. This study uses the 4-D development model by Thiagarajan et al. (1974), including the define, design, development, and disseminate stages.

The subjects in this study consisted of two media experts, two material experts, 26 students of the Biology Study Program Class D 2020 as a small group, and students of the Biology Education Study Program class 2019 A, 2019 B, and 2019 C, totaling 78 students as a large group. When this research is underway, small and large groups are students taking the Invertebrate Taxonomy course. The object of this research is Adobe Flash CS6-based learning media on Arthropoda material which expert lecturers will validate to assess its quality and feasibility to produce appropriate learning media.

The data collection instruments used in this study were learning media validation sheets and student response questionnaires. The media validation sheet is used to test the feasibility of the developed learning media. According to the respondents in the study, media validation sheets are divided into two types: validation sheets for material experts and validation sheets for media experts. Questionnaires were used to test student responses to the feasibility of the learning media developed.

Before the validation sheets and questionnaires are used to validate the product, the questionnaires are first validated by an expert lecturer as a questionnaire validator. The result of the validation is a questionnaire that is feasible to use. After the questionnaire is declared suitable for use, the questionnaire can then be used to assess the feasibility of learning media by expert lecturers and students.

The data analysis technique in this research is qualitative descriptive data analysis and quantitative descriptive data analysis. Qualitative data sources come from suggestions and inputs filled in on the validation sheet and get responses. Sources of quantitative data were obtained from expert validation sheets and student response questionnaire sheets.

The data obtained through expert validation sheets and student response questionnaires will be converted into qualitative data in the form of intervals using a Likert scale with the provision that the ideal maximum score is five and the ideal minimum score is 1. The scores obtained were then converted into qualitative data on a Likert scale. Based on the formula obtained calculations for each aspect as presented in Table 1.

Table 1. Score conversion guidelines

Interval Score	Category
X > Mi + 1,8 Sbi	Very good
Mi + 0,6 SBi < X ≤ Mi + 1,8 Sbi	Good
Mi - 0,6 SBi < X ≤ Mi + 0,6 Sbi	Moderate
Mi - 1,8 SBi < X ≤ Mi - 0,6 Sbi	less
X ≤ Mi - 1,8 Sbi	Very less

(Djaali & Muljono, 2008)

RESULTS AND DISCUSSION

This development research applies a research model adapted from the 4D Development model. In the define stage, the researcher analyzes the initial problems found during THI learning using a questionnaire. The questionnaire distribution was carried out to Biology Education students in 2019. It turned out that after the analysis, 84.4% of students experienced difficulties in studying THI courses. According to students, using PPT alone is not enough to understand THI material well, so students need different learning media. As it is known that the material displayed in the PPT only contains material points taught by the lecturer, this makes students still confused and feels it is not enough to help students understand THI courses. At this stage, an assessment of the ongoing 2020 THI THI RPS material is also carried out. Based on the THI RPS, there are indicators of student achievement: explaining the general characteristics of Arthropods, explaining the particular characteristics of Arthropod animals, and explaining morphology, anatomy, and physiology, the key to determining conservation status and the role of Arthropods in daily life. Arthropod animals are close to the student environment. Although Arthopda animals can be found easily in daily life, they often escape students' attention. So, just giving the material is not enough to understand identifying the phylum Arthropoda.

In the questionnaire analysis of student needs for learning media, it was shown that the majority of students stated that the learning media they had used so far were not sufficient to meet their needs. All students from the research subjects stated that students needed additional learning media. Based on these findings, students need interactive learning media, including material coverage, audio, supporting images, and video observations. There is an evaluation and contains a glossary that will make it easier for students to learn.

Next is a task analysis, carried out to identify the main tasks and materials given to students based on course learning outcomes (CPMK) and achievement indicators for the Semester Learning Plan (RPS) of Invertebrate Animal Taxonomy 2020 that is currently running on Arthropoda material.

The Design Stage is designing learning media development based on the findings at the defined stage. The choice of interactive learning media is because it follows the needs of students for learning media, namely containing material, images, animations, learning videos, glossaries, and evaluations packaged in android form.

At this stage, the researchers designed learning media in the form of storyboards to facilitate and become a reference for making learning media. It also collects several aspects at this stage, namely Arthropod material, evaluation questions, pictures, animations, and making observation videos. After all, aspects are collected, then applied to the Adobe Flash CS6 application by

racing on the storyboard. Interactive learning media is designed based on the VISUAL principle, visible, attractive, simple, functional, legitimate, and structured (Miftah, 2013). Presentation of material will be more exciting and easy to understand if presented with pictures and videos, following the Komalasari (2011) reported that an image, photo, or video can provide an accurate picture that shows the actual object and provides meaningful and precise learning compared to words to stimulate students' thinking skills.

In designing this learning media, the format used is learning media based on android applications using Adobe Flash Professional CS6 software. Adobe Flash CS6 was chosen because it has features that support the development of interactive learning media. The stages in designing learning media include the initial learning media design, menu design, storyboard design, and the product manufacturing process. So that the resulting material display design from the learning media is as follows (Figure 1).

Figure 1. Material page of the learning media

After the product is finished, the product will be validated by material experts and media experts to assess the feasibility of the product developed before the product is tested on students.

The Development Stage is the advanced stage of the design stage. This stage consists of an assessment by the validator, namely material experts and media experts, and product trials for

small and large groups. The initial learning media will be validated first by material and media experts, then through the revision stage, and then tested on small and large groups to assess the feasibility of the learning media development.

Material experts conduct an assessment to obtain data and information about the various weaknesses of the learning media that are being developed. These weaknesses will be used as the basis for improvement (revision). Material experts will assess aspects of the quality of material content, learning quality, and aspects of language and communication based on the evaluation criteria of learning media according to Wahono (2006) and Walker and Hess (1984) on the developed learning media.

The assessment of learning media is viewed from two aspects, namely visual communication aspects and software engineering aspects. With this assessment guide, developers can determine whether or not revisions are needed in these three aspects. The results of the material expert assessment are in Table 2.

Table 2. Results of media assessment by material experts

Aspect	Before revision	After revision
Content	35,5	43,5
Learning desain	47	50
Language and communication	8	9
Average score	86,5	97,5
Category	appropriate	very appropriate

Before the revision, the material expert's assessment obtained an average score of 86.5, which was in the appropriate category. During the material assessment, material experts provide suggestions and comments to improve the quality of learning media. After the revision based on the advice of the material expert, further validation was carried out. The average score after the revision increased to 97.5, with a very appropriate category.

The high acquisition value of the feasibility of learning media has met the eligibility criteria of learning media, which refers to the assessment criteria of learning media by Wahono (2006) and Walker and Hess (1984).

Assessment from Media Expert

Media experts conduct assessments to obtain data and information about various weaknesses of learning media developed. These weaknesses will be used as the basis for improvement (revision). Media experts will assess

aspects of software engineering and aspects of visual communication based on the evaluation criteria of learning media according to Wahono (2006) and Walker and Hess (1984) on the developed learning media.

Media assessment is viewed from two aspects, namely visual communication aspects and software engineering aspects. With this assessment guide, developers can determine whether revisions to learning media are needed in these two aspects. The results of the media expert's assessment are in Table 3.

Table 3. Results of media assessment by media experts

Aspect	Before revision	After revision
Visual communication	51	64
Software engineering	34	43
Average score	86,5	102,5
Category	appropriate	very appropriate

Assessment of the quality of learning media before the revision obtained an average score of 86.5 with a decent category. In the assessment, media experts provide some suggestions and comments to improve learning media. After going through the revision process, the learning media was validated again. The average score after the revision increased to 102.5, with a very decent category.

Arthropoda learning media contains several components that show the effectiveness of a learning media, namely text, audio, images, animations, and videos that make it easier for students to understand the structure of Arthropod material. In addition, the quality of the images and videos used is clear, attractive, clarifies the delivery of descriptions, and is representative of the delivery of concepts. According to Komalasari (2011), an image, photo, or video can provide an accurate picture that shows the actual object and provides meaningful and precise learning compared to words to stimulate students' thinking skills. So that the use of observational pictures and videos in learning media is effective for concretizing something abstract, eliminating verbalism, clarifying material to students, and showing actual events, and the animations presented are effective in explaining a process that is difficult to see directly with the eye.

Small-Group Trial

Product trials conducted by 26 students also assessed the learning media in terms of four aspects: the quality of material content, aspects of learning design quality, aspects of visual communication, and aspects of software engineering. Based on the results of the data analysis of the small group trial learning media assessment, it is shown in Table 4.

Table 4. Media assessment results in small group trials

Aspect	Score	Average	Category
Content	409	15,73	Appropriate
Learning design	642	24,69	Very appropriate
Visual communication	674	25,92	Very appropriate
Software engineering	452	17,38	Very appropriate
Language and communication	240	9,23	Very appropriate
Total Score	2417	18,59	
Average	93		Very appropriate

Revisions were made to improve learning media based on suggestions and input from the results of limited field trials. Suggestions for improvement given by students to learning media on Arthropoda material, in general, are that it would be better if the size or capacity of the learning media were reduced again so that it did not consume android storage. Based on the suggestions and inputs given by students at the small group trial stage, no revision was made because the files contained in media such as videos, music, and pictures have been designed with a minimal size if the files are made into a smaller size, it is feared video, audio and images cannot be seen clearly due to the low resolution of these files so that it can reduce the quality of the learning media. Furthermore, the learning media was tested on a large group trial group.

Disseminate Stage

The deployment stage is the final stage of development. The implementation of large field trials is carried out after the product revision activities are declared completed. At this stage, a large field group trial was carried out involving 78 students consisting of the Biology Education Study Program class 2019, which amounted to 27 students, the Biology Education Study Program class B 2019 totaling 25 students, and the Biology Education Study Program class C. 2019, totaling 28 students. Like small group trials, large group trials are carried out privately through each student's android.

The purpose of this stage is to obtain an assessment of the feasibility and effectiveness of

the learning media on the Arthropod material developed, which is assessed by real users.The results of the assessment of learning media obtained at the large group trial stage are in Table 5.

Table 5. Results of media assessment in large group trials

Aspect	Score	Average	Category
Content	1486	19,01	Very appropriate
Learning design	2217	28,42	Very appropriate
Visual communication	2216	28,41	Very appropriate
Software engineering	1462	18,74	Very appropriate
Language and communication	735	9,42	Very appropriate
Total Score	8116	20,8	
Average	104,1		Very appropriate

The assessment results of learning media obtained an average score of 104.1, which is in the very feasible category. The use of learning media in the learning process will significantly help the effectiveness of the learning process and the delivery of messages and lesson content at that time (Arsyad, 2002). Arthropoda learning media allows students to interact directly and exercise direct control over information sources so that students can control and obtain what they need, for example, reading material on the characteristics and classification of Arthropods—contained in the learning media. Students can also work on evaluation questions that have been equipped with feedback to find out the mistakes made in working on the evaluation questions.

Components in learning media such as observation videos, pictures, and materials make students interested in the learning process and make students enthusiastic in the learning process, and learning media can be used with or without the internet. Learning media is also equipped with a glossary containing terms used in Arthropod material, and there is a list of references used in compiling the material. In the learning media, there are several web links. When clicked, it will go to the web page. The addition of the link is intended as an additional student reference. This link can be accessed if the smartphone is connected to the internet.

Arthropoda learning media based on android application is an innovation of learning media for THI courses using smartphone technology using Adobe Flash CS6. This learning media can be developed following the current

development of science and technology.

According to Rusman (2015), learning media can overcome the limitations of space, time, energy, and sensory power. In explaining learning objects that are very broad, large, narrow, minor, or dangerous, one can use learning media that brings students closer to the object in question. By using learning media, the learning experience can be improved because the media is a messenger technology used for learning purposes.

Android application-based learning media is a learning media that utilizes information technology development, namely smartphones packaged attractively in an Android-based application. According to Rahmaibu (2016), research and development in technology is a form of utilizing technology or ICT. Mobile learning is an innovation that utilizes technology in electronic devices such as smartphones as learning media to support the learning process.

Nowadays, the use of smartphones is prevalent. Besides being easy, smartphones are also used for various purposes such as communication, entertainment, and education (Timbowo, 2016). The application of learning media is expected to increase technology as a medium of learning. In addition, it is expected to stimulate students to use their smartphones for educational purposes. According to Rusman (2015), learning media that have high effectiveness have a remarkable impact on the learning achievement of users. The use of good and appropriate learning media will benefit lecturers and students. It can help smooth the teaching and learning process and is very useful for students because it increases the introduction and understanding of Arthropod material.

CONCLUSION

Learning media based on Adobe Flash CS6 on Arthropoda material has been successfully developed. The learning media is packaged in an android application with an app extension. There are several main menus in the learning media, including instructions for use, indicators and learning objectives, materials, evaluations, glossaries, reference lists, and developer profiles. The learning media developed have met the criteria for interactive learning media because they include text, images, animation, video, and audio.

The learning media that has been developed is very suitable for use in lecturing Arthropod material at Unimed. The determination of the feasibility of the learning media was obtained from the results of the validation of learning media by material experts with an

average value of 97.5 in the very feasible category, media experts with an average value of 102.5 in the very feasible category, small group trials with an average value of 93 in the very feasible category. Furthermore, the large group trial with a mean value of 104.1 was in the very feasible category.

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