Development of Biology Learning Media Based on *Adobe Flash* to Increase Interest and Conceptual Understanding.

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Abstract. This research aims to know the feasibility and effectiveness of interactive biology learning media product of human reproduction system based on adobe flash and to know the influence of application of learning media developed to increase interest and conceptual understanding. This development research refers to the developmental step by Borg & Gall. The field trial subjects in the experimental and control class consisted of 35 students science second grade 5 and 3 Kota Mungkid High School. Collecting data used questionnaires, interview guides, evaluation media product sheets, interest questionnaire sheets, and concept comprehension tests. Quantitative data analysis techniques used independent t-test. The results showed that the learning media viewed from media experts and material experts categorized good. The result of independent t-test significance value is <0.05 and interest learners have increased was categorized as medium, the early learning interest is 65.1 and the final learning interest is 83.7 in treatment class. So it can be concluded that the learning media used is feasible and effective for use in biology learning process to increase interest and conceptual understanding.

Keywords: learning media Adobe flash, human reproductive system, interest and conceptual understanding.

1. Introduction

In essence, biology is the science of science that learn about living things from various aspects of the problem and level of organization and learn about the structure and function of the human body tools that work together with each other that form a system, where in each system there are components that support each other for the entire system to take place [1]. Biology learning is an interaction of teaching and learning that occurs between teachers and learners in an educational system through good communication by involving biological objects in real and with the help of instructional media. According to [2] the function of the media includes a clear picture of objects / things that are hard to observe directly because of their unlikely size, either too large or too small. According to [3] the media is a tool or means used to carry information from a source and delivered to the recipient, so that the
recipient understands the information. According to [4], the role of the media when used in the class among others to increase interest, understanding, and improve the memory of learners. According to [5], media effects in learning include media support for various types of learning interactions. Media can be developed into multimedia which is a combination of text, graphics, animation, audio and video in a technology such as computer or television [6]. Multimedia has the advantage of making learning more meaningful, improving the learning experience and learning learners become more comfortable so as to make learners motivated, interested and passionate [7]. According to [8], multimedia can foster the interest of learners at the time of study, because multimedia makes us more access to the information contained therein. Multimedia offers a visualization of almost the same as the original object and has excellent functionality, so it can foster interest, motivate learning and engage in learning activities According to [9] that, "Interactive multimedia instruction is an instructional program which includes a variety of integrated source in the instruction with the computer at the heart of the system. The program is intentionally designed in segments, and viewer responses to structure opportunities influence the sequence, size, contents and shape of the program". One example of interactive multimedia that is often used in learning is adobe flash. According to [10], flash is a software that has the ability to draw and animate it, besides flash can also be used for other purposes such as in the making of games, presentations, create web pages, interactive multimedia applications, learning animation and even film making. [11] states that: "Adobe flash is a multimedia platform used to add animation, video, and interactivity to web pages. Flash is frequently used for advertisements and games. More recently, it has been positioned as a tool for the so called 'Rich Internet Application' ('RIA'). According to [12], flash is the most widely used technology in making web page animations, one of the biggest benefits is that the files used do not require too large a size. Adobe flash is one of the programs that support for making interactive animations [13]. It is known that the interactivity element of the media is that learners and teachers (users) can control the flow of information within the content of the material delivered [14]. In line with this, [15] stated that Adobe flash is the most popular way to add animation and interactivity to web pages. When you walk on a flash project, the source file that you save is a .fla. When you want see how your project will look on the web page, you will publish the file as an .swf.". According to [16] adobe flash has several elements such as panel tools, timeline, layer, frame and stage. The advantages of using flash as a learning medium are scalability, independence, consistency, integration of sound, small files, high quality graphics and small plug-ins [17]. In addition, according to [18] the benefits of adobe flash as multimedia elements are 1. text, simplifying complex material to be simple and as a media feedback. 2. Audio, improves motivation with sound and makes learners focus. 3. Video, displaying real state, can be replicated and describe clear procedures. 4. Graphics, easier to identify and classify objects show the spatial relations of objects and able to explain abstract concepts. 5. Animation, showing the characteristics of the object ideally raises the effect of explaining the difficult concept of explaining the concept of abstract to concrete and able to show the step clearly.

[19] states that the interests of learners can be seen through increased attention, cognition, perseverance, and involvement. According to [20] defining interest as follows, "Interest is defined as a contingent-specific motivational characteristic composed of intrinsic feeling-related and value-related valences. To many psychologists, interest is vague, everyday term that denotes a personal characteristic or an affective state and that has been thoroughly investigated by modern motivational psychology. Specifically [21], it seems that interest is divided into two: personal interests and situational interest. Personal interest arising from within is eternal and situational interest arises from the environment, spontaneously and temporarily. [22] said that "the level of interest has been influenced by learning," according to [23] an indicator of interest in learning that is the feeling of pleasure, interest, acceptance and involvement of students. According to [24], interest is a sedentary tendency in subjects to feel happy and interested in certain fields / things and feel happy to be involved in that field. So that interest in learning can be interpreted as a desire someone to continue to learn because it has had a feeling of fun towards the learning activities so it will help them to facilitate understanding the concept of learning. Concepts by [25], "A concept is an abstraction of events, objects,
or phenomena that seem to have certain properties or attributes in common". According to [26] states that "Conceptual understanding as a process. When this process is utilized by educators, students may better connect and organize knowledge aiding in the knowledge transfer that occurs between theory and practice ". Therefore, conceptual understanding is a key aspect in the learning process that can be an indicator of success or failure of a learning activity. Understanding the concept is the result of learners learn in the realm of cognitive. According to [27] states that the cognitive process dimension of human capability, which is a revision of the taxonomy of bloom includes 6 processes namely remember C1, understand C2, apply C3, analyze C4, evaluate C5, and create C6.

The results of the preliminary study through interviews with biology teachers and several class XII students of SMA 1 Mungkid in the 2017-2018 school year showed that the material of human reproductive systems is classified as material that is difficult for students to learn, this is supported by daily results of reproduction systems, as many as 65% of students get scores under the KKM. The broad scope of material and a variety of bioprocess mechanisms that cannot be seen clearly with complex processes and the limited variety of instructional media used make students feel difficult in understanding the reproductive system material concepts well so that learning media can visualize all components and the bioprocess mechanism of human reproductive system material is attractively.

According to biology teacher and learner class XII sub the material is the mechanism of bio process reproduction of the human reproductive system in the female reproductive cycle of the menstrual cycle. According to [28] the menstrual cycle is divided into three phases on the structural and functional changes in the endometrium: the menstrual phase, the proliferative (or follicular) phase, and the secretory (or luteal) phase. Correspondingly, according to [29] the endometrium undergoes cyclic changes controlled by ovarian estrogen and progesterone. Menstrual processes that can not be directly observed and mechanisms involving various stages of cycle and reproductive hormone using various scientific terms make this material difficult to understand. Based on the analysis of needs, is done Development of Learning Media of Human Reproduction System Based on Adobe Flash to Increase Interest Learning and Understanding Concept of Student of science second grade at Kota Mungkid High School.

2. Methods

This research type is Research Development using Borg & Gall model with three stages of procedure that is: (1) preliminary study, (2) media production, (3) assessment / evaluation of media [30]. The trial subject is limited involving 15 science third grade students and the field trial subjects in the experimental and the control class consisted of 35 students science second grade 5 and 3 Kota Mungkid High School with used non equivalent control group design. Collecting data used questionnaires, interview guides, evaluation media product sheets. Data type in this research is qualitative data from validation result of suggestion and comment from expert validation to Learning Media and quantitative data from analysis result of product assessment, interest questionnaire sheets, and concept comprehension tests data with quantitative data techniques used anacova test.

3. Result and Discussion

3.1 Results of Validation by Expert Judgments

Assessment results are obtained from peers, materials experts and media experts, biology teachers and learners.

| Value | Score Interval | Category       |
|-------|----------------|----------------|
| 5     | >4,20          | Very Decent    |
| 4     | 3,41-4,20      | Decent         |
| 3     | 2,61-3,40      | Sufficient     |
| 2     | 1,81-2,60      | Deficient      |
| 1     | <1,80          | Very Deficient |

Table 1. Conversion Score Assessment Likert scale of five
### Tabel 2. Assessment Results

| Expert Judgments | Learning materials | Design and learning strategies | Technical quality and appearance |
|------------------|--------------------|---------------------------------|----------------------------------|
| Results by Peers | 4,8                | 4,7                             | 4,6                              |
| Results by Material Expert | 4                | 4,1                             | -                                |
| Result by the media expert | -               | -                              | 3,7                              |
| Results by Biology Teachers | 4,6              | 4,8                             | 4,7                              |
| Results of One-to-One Trial by Learners | 4,6            | 4,5                             | 4,7                              |

The results of product assessment by peers are considered very feasible. Suggestions and comments from peers are a more colorful and interactive media display to make it more. And then by materials experts and media experts are categorized as good. The advice given by the material expert is on the menstrual cycle material more clearly clarified and correct the spelling according to EYD. Suggestions and comments provided by the media expert that the breadth of material contained in the material needs to be improved, interactive media functions that can increase learning interests of learners need to be reproduced. The results of product assessment by biology teachers and learners are considered very good and highly feasible. The advice given by the biology teacher is to add more pictures of the human reproduction system and video animation. Suggestions from the one-to-one test that is in writing in the media still have the words and typing wrong so it needs to be fixed. Expert judgment also performs instrument validation about pretest post-test and interest interest questionnaire. The improvement suggestions include indicators on the lattice and pretest and post-test questions need to be considered again, the sentence in each question is adjusted to the EYD and questionnaire interest in learning needs to be added aspect assessed.

### 3.2 Product Trial Results

The results limited trial, based on pretest and post-test data it is known that there is an increase of concept comprehension value, that is 40% from limited test subject has value of gain score with medium category. However, the average gain value of concept comprehension is generally greater than 0.70 ie 0.71. The level of understanding of the concept is in the high category. This means that the use of Human Reproduction System Learning Media based on Adobe Flash can improve understanding of learners concept. The field trial subjects in the experimental class consisted of 35 students science second grade and the field test subjects in the control class were 35 students science second grade 3 Kota Mungkid High School

### Tabel 3. Result of normalitas test

| Class     | One-Sample Kolmogorov-Smirnov Test | Statistik | Sig. |
|-----------|-----------------------------------|-----------|------|
| Pretest   | Experiment                        | 0,844     | 0,474|
|           | Kontrol                           | 1,084     | 0,191|
| Posttest  | Experiment                        | 1,015     | 0,255|
|           | Kontrol                           | 1,193     | 0,116|

### Tabel 4. Result test of homogeneity of variances

|                          | Levene Statistic | df1 | df2 | Sig.     |
|--------------------------|-----------------|-----|-----|----------|
| Pretest                  | 2,765           | 1   | 68  | 0,101    |
| Posttest                 | 0,556           | 1   | 68  | 0,458    |
Product field trial results all data are normally distributed and homogeneous because they have Sig> 0.05. Based on table 6, it can be seen that the significance value is <0,05, this means that the use of adobe flash-based learning media is effective to improve conceptual understanding because multimedia flash can help students more easily remember the material that has been learned. Result of gain score interest learners have increased was categorized as medium, the early learning interest is 65.1 and the final learning interest is 83.7 in treatment class. Increased interest due to multimedia has a function to stimulate the attention of learners become more focused in studying the human reproductive system so that learners become familiar with the concept of human reproductive system. So it can be concluded that the learning media used is feasible and effective for use in biology learning process to increase interest and conceptual understanding.

The results of limited&field trials can prove the use of learning media of the human reproductive system can improve understanding of the concepts and interests of learners learn. Therefore, it can be stated that adobe flash is one of the suitable multimedia used in biology learning process, especially human reproduction system because information on adobe flash has two modalities that is visual plus hearing called double coding. According to Mayer [31], on the theory of CTML (Cognitive Theory Multimedia Learning) there are five forms that are processed by memory. The first form is the spoken words and images when presenting the material on the multimedia itself. The form of both sounds is captured by the ear and the image is captured by the eye in the sensory memory. The third form is sound and image in working memory. The fourth form is the verbal model and the pictorial model is also contained in working memory and the fifth form is prior knowledge stored in the long-term memory integrated verbal and pictoral.

### Table 5. Group Statistics

| Group      | N  | Mean | Std. Deviasi | Std. Error Mean |
|------------|----|------|--------------|-----------------|
| Gain       |    |      |              |                 |
| Experiment | 35 | .6920| .10548       | 0.01783         |
| Kontrol    | 35 | .4801| .10015       | 0.01693         |

### Table 6. Independent Sample Test

| Levene test | T test for equality of means |
|-------------|-----------------------------|
| F | Sig | t | df | Sig | Mean differen | Std. Error Differen | 95% confident interval of the difference |
|-------------|-----------------------------|
| Equal variances assumed | 127 | .723 | 8,620 | 68 | .000 | .21191 | .02459 | 16286 | 26097 |
| Equal variances not assumed | 8,620 | 67,81 | .000 | .21191 | .02459 | 16285 | 26098 |

Image 1. Cognitive Theory Schema Multimedia Learning Mayer: 2010a
The results of [32], concluded the class with the delivery of the material using a combination of text and sound learning outcomes better than the classroom by using text. Correspondingly, the results of the study [33] there is significant improvement in learning outcomes using the American history-based software history program. According to the results of the study [34], also show the result that classes using Interactive multimedia methods show better learning outcomes and have stronger memories in English lessons than with conventional methods. In addition, research from [35] states that the development of Learning Media Biology Based Adobe Flash can improve Competency Mastery in Curriculum 2013. Result of research [36] development of interactive biology learning media of body defense system based on adobe flash effectively to increase interest in learning and understanding of learners concept. Based on some research results prove that adobe flash based learning media is an appropriate choice in the use of educational media in the learning process with high level of material abstraction, so it is difficult if it must do learning directly with the action or called learning by doing for example doing practicum (involves many senses). This refers to the dale cone theory of experience (Dale's cone of Experience).

![Image 2. Cones of Dale's Experience](image)

The cone of Dale's experience explains in the cone do not necessarily mean that the learning process must start from the immediate experience but begins with the type of experience that best suits the needs and abilities of the learners encountered by considering the learning situation [37]. The message abandonment rate will be higher if the messages are summed up into symbols such as charts, graphs, diagrams and so on. If the message is contained within such symbols then the senses to be involved in the most appropriate processing are visual and audio (audiovisual) thus the process of receiving messages will be more efficient. So it can be concluded that adobe flash based learning media is very aptly used in the learning process of materials with high level of abstraction such as material of human reproduction system.

4. Conclusions
The results showed that the learning media viewed from media experts and material experts categorized good and feasible. The result of independent t-test significance value is <0,05 this means that the use of adobe flash-based learning media is effective to improve conceptual understanding. And then result of gain score interest learners have increased was categorized as medium, the early learning interest is 65.1 and the final learning interest is 83.7 in treatment class. So it can be concluded that the learning media human reproductive system based on Adobe Flash is feasible and effective for use in biology learning process to increase interest and conceptual understanding.
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