

Development of Biology Learning Media Based on Macromedia Flash in the Era of Industrial Revolution 4.0

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Abstract— This study aims to describe the validity, practicality and effectiveness of Macromedia Flash in Biological Learning in the Industrial Revolution Era 4.0. The research method in this research is the development or Research and Development (R&D), using the One-shot Case research design. Stages in this research process include (1) analyzing students, (2) stating goals, (3) choosing methods, media, or materials, (4) utilizing media and materials, (5) requiring learning participation, (6) evaluating and revising, this study was conducted in 3 secondary schools in Banjarmasin involving 30 students. The method used for data collection is a questionnaire for media validation and practicality of the media as well as test questions to determine the level of graduation of students. In this study, the results of the validity of Macromedia Flash were 91.83% included in the highly valid criteria. Student responses to interactive learning media or practicality scores were 84.23% included in the Practical category, and student graduation results were 100% included in the excellent category. Thus it can be concluded that the Biology learning media based on Macromedia Flash is in the good category and suitable for use as a medium in the learning process. Based on this, Macromedia Flash can be one of the biology learning media in the Industrial Revolution Era 4.0.

Keywords: *macromedia flash, biology learning, era Industrial Revolution 4.0*

I. INTRODUCTION

Education 4.0 is a general term used by educational theorists to learn various ways to integrate cyber technology both physically and not into learning. Education 4.0 is a phenomenon that answers the needs of the 4.0 industrial revolution where humans and machines are aligned to get solutions, solve problems and of course find solutions to new innovations. Basic education to higher education, adjusting the education curriculum with the challenges and needs of the present age.

The world of education is the main and central thing to get the flow of this industrial revolution

because it will print and produce quality generations who will supply the industrial revolution 4.0. Education in the era of the industrial revolution 4.0 consists of ways of learning, patterns of thinking and the way students develop innovation in various fields. With this, the hope of winning the competition in Indonesia can be done in the global market.

The industrial revolution 4.0 not only provides opportunities, but is also challenging for millennials. The progress of science and technology as a trigger for the industrial revolution was also followed by increasingly high competencies. For this reason, technological innovation in education to support learning is needed in this era to improve the quality of human resources that can compete in the global arena, so we need teachers and creative and innovative learning. Surely this will work with the support of information and communication technology in the industrial revolution 4.0 era.

Creative and innovative learning can be implemented if a teacher is good at choosing which media is better and more appropriate to convey a message. Not only in the selection, teachers are also faced with the effective procurement and utilization of teaching media, both in the curriculum process or in class implementation and preparing teaching material [1].

Learning media is an important thing, including in the Biology learning process. The media can assist in the delivery of material, the existence of media can make abstract material concrete, and complicated material easy to understand. Based on the results of observations made by researchers there are several materials that require a high enough understanding of the concept so that to help understand the concepts in the material required learning media. The selection of appropriate learning media on biology learning can increase student interest in learning. In the Era of the industrial revolution 4.0 emphasized the use of technology in the learning process. The learning media that uses Macromedia flash professional program is

one of the learning media that can be used as an interesting and interactive learning media that is based on technology. Through the use of this learning media, it is hoped that it can foster student interest in learning biology which in turn can improve student learning outcomes and students can learn anytime or anywhere by using technology.

Learning with computers can stimulate students to do various exercises due to the availability of various animations, graphic illustrations, and colors that add realistic [2]. Computers can also accommodate students who are slow to accept lessons because they can provide a more effective climate in a way that is more individual and not boring. In addition, the use of computers can provide feedback directly to students so that mistakes can be corrected [2].

One of the media that is suitable with technological development and can be used in the learning process is Macromedia Flash. Macromedia Flash program can be used as an interesting and interactive learning media because it contains text, images and animations. All students can play an active role in the learning process with the Macromedia Flash program to enable students to learn independently in understanding a concept. By doing so, it is expected that competency standards and basic competencies can be achieved. Based on this, then in this study a computer-aided learning media was prepared using the Macromedia flash program used in the learning process in the Industrial Revolution Era 4.0

II. METHOD

The approach used in this research is development research which refers to the Research and Development (R&D) model. The Research and Development method (R&D) is a method of research carried out to produce a certain product, and also to test the effectiveness of the product [3]. In this study the effectiveness of learning media is measured by the percentage of students completeness based on KKM (Minimum completeness criteria). For more details the stages are shown in Figure 1.

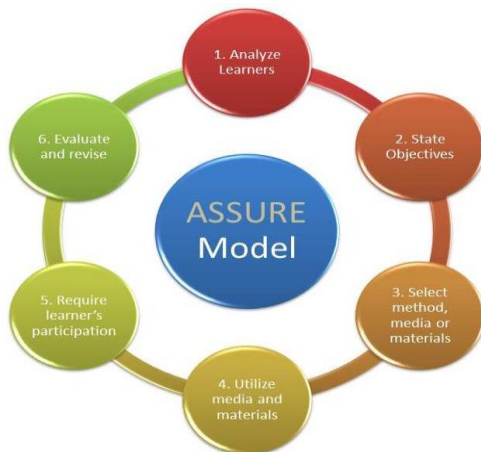


Fig. 1. ASSURE Development Model Flow Chart [4]

The results of the study were not mass-produced and limited trials. The design of this study uses the One-Shot Case Study. One-Shot Case Study study design. The learning media trial was conducted at 3 high schools in Banjarmasin with 30 research subjects. While the research time was carried out in the even semester 2018/2019. In this study the research instruments used were: (1) a media validation sheet filled out by the teacher and lecturer (2) a student questionnaire response sheet filled out by class students (3) test questions for students. The result of expert validation were analyzed on the percentage and then validity can be measured using the following formula [5]:

$$K = \frac{F}{N \times I \times R} \times 100\%$$

Information :

K: Percentage of eligibility

F: Number of respondents' answers

N: The highest score in the questionnaire

I: Number of questions in the questionnaire

R: Number of respondents

The percentage will be known by the calculation using the formula. The product criteria are shown in Table 1 [5].

TABLE I. VALIDITY BY EXPERT CRITERIA

Value	Validity	Decision
0%-20%	Very less valid	Big revision and should be consulted
21%-40%	Invalid	Big revision and should be consulted
41%-60%	Valid enough	Product can be used by improving much aspects
61%-80%	Valid	Product can be used by improving some aspects
81-100%	High validity	New product can be used in learning process

The practicality or readability test questionnaire was also analyzed qualitatively and quantitatively. Data in the form of suggestions and criticisms from students were analyzed with a qualitative approach, while the acquisition of scores from the recapitulation of practical assessment data was carried out with a quantitative approach. The results of practicality assessment of students analyzed can then be measured using the following formula:

$$Value\ of\ Practicality = \frac{Total\ score}{Maximum\ score} \times 100\%$$

The percentage will be known by the calculation using the formula. The product criteria are shown in Table 2 [6].

TABLE II. CRITERIA FOR ASSIGNING PRACTICALITY

Practicality value (%)	Criteria
86 – 10	Very practical
76 – 85	Practical
60 – 75	Practical enough
55 – 59	Not practical
54	Not practical

The effectiveness test of Macromedia Flash teaching materials is carried out using a quantitative approach by calculating the ratio of the number of students whose grades are complete or above the KKM (≥ 75) with the total number of students in the class. The purpose of the effectiveness test is to find out the suitability of the Flash teaching materials that have been made with the achievement of learning objectives.

The technique in effectiveness test is by the formula [7]:

$$\text{Value of effectiveness} = \frac{\text{Number of students with a grade} \geq 75}{\text{Total students}} \times 100\%$$

The effectiveness results can be seen from the percentage of students completeness in answering pretest and posttest questions. Where the indicators in the questions are in accordance with the Competency Achievement Indicators in the RPP, then analyzed and compared with the category seen in Table 3 [8].

TABLE III. CRITERIA FOR EFFECTIVENESS

Effectiveness value (%)	Criteria
85-100%	Very effective
69-84%	Effective
53-68%	Less Effective
37-52%	Ineffective
20-36%	Very Ineffective

III. RESULTS AND DISCUSSION

A. ASSURE stage

The stages developed in the ASSURE Model consist of 6 steps. Following are the stages of the ASSURE learning design model.

1). *Analyze Learners*: based on the results of interviews with teaching teachers at 3 Banjarmasin SMAN, regarding Biology material from several material concepts there are some materials that are difficult to explain and difficult to understand by students so that many things cause students to be difficult to understand and require learning with good visualization. Macromedia Flash needs analysis is also carried out, namely analyzing syllabus and lesson plans to obtain flash information needed by students in learning the programmed competencies. The results of the initial analysis of the characteristics of students in

learning also get information that has a lack of curiosity that arises from within, because the learning process that has been structured ie is only centered on the teacher. Students tend to only like to listen to the explanation from the teacher.

2) *States Objectives*: making special objectives needs to be considered by referring to the curriculum used, namely the 2013 curriculum which is determined based on Competency Standards. So that appropriate objectives can be designed that are expected to achieve learning objectives. Identification and analysis of competency standards to be studied, so that learning materials that need to be learned to master these competency standards are obtained.

3) *Select Methods, Media, and Material*: selection of methods, media, and materials: in this step the teacher chooses the right strategy, suitable media and material relevant to the objectives to be achieved. Learning media available in the classroom are already complete, LCD projectors and a set of other learning tools are still functioning properly. The completeness of the tools and media that support the learning system makes it easier for students to observe various objects displayed by the teacher, be it in the form of pictures, photos, videos and so on. However, the obstacle is that the teacher needs learning media that activates students and so students can learn independently and grow student interest in learning.

Seeing from the field analysis that occurs, the writer tries to develop Macromedia Flash. With the existence Macromedia Flash it is expected that students can play an active role and utilize and use existing media.

4) *Utilize Media and materials*: this stage the teacher uses technology, media and materials, namely PPT and Flash. Thus helping students achieve their learning goals.

5) *Require Learner Participation*: stimulate student participation, ie students are told to use flash so that they can practice the new knowledge or skills presented so that students can re-express everything they have. This stage students are involved in the use of Macromedia Flash. The teacher stimulates student participation, it is intended that learning conditions can activate students. It is hoped that they will be able to practice the new knowledge or expertise presented. The practice that can be done is to be able to use computer-based teaching materials in the form of Macromedia Flash.

6) *Evaluate and Revise*: Individual evaluation is a stage that needs to be done to make direct contact with several students to get input on the attractiveness and attractiveness of Flash. Evaluation to test the Flash program with a small group of prospective users consisting of 30 students. This evaluation is carried out to obtain input that can be used to improve the quality of the program. Field evaluations are program trials before they are used in real learning situations.

Revisions and evaluations given by lecturers are used to improve criteria that are not yet suitable for making Flash. After the evaluation phase is complete. Then continued by revising the draft learning program. Data obtained from formative evaluation procedures are summarized and interpreted to find out the weaknesses of the learning program. Evaluation is not only done in the draft learning program, but also in the learning system design aspects used in the program.

B. Validity

The media validator of the flash concept teaching material system consists of 3 lecturers supporting courses in the Development of Teaching Materials in three teachers who are teaching teachers at the research school. The results of data analysis, validator of 91.83% which means it is very valid. Based on the results of the validation by the validator stated that the teaching material that has been made has a validation rate of about 91.83% so that it can be declared valid and is suitable for use in the biology learning process. But there are a few suggestions from validators for improvements Comments and suggestions from expert validators are rather large writing, less bright background colors, and add more examples of images and glossaries.

C. Practicality

The practicality results were obtained from the student response instrument sheet (questionnaire) related to the practicality of using Macromedia Flash that had been developed. The purpose of the practicality test is to determine the feasibility of Macromedia Flash material that has been developed based on student assessment. Based on Macromedia Flash that has been developed and tested in practicality on 30 students, they provide an assessment on a questionnaire that has been presented with the criteria that have been determined. The result is 84.23% which means the practicality of Macromedia Flash is practical.

D. Effectiveness

Based on the results of the study, an assessment of the effectiveness of using Macromedia Flash was measured based on students' cognitive learning outcomes. Analysis of the cognitive learning outcomes of the product shows that all students (30 students) completed individually and classically achieved 100% completeness. Based on this, it is known that the development of Macromedia Flash teaching materials can help students in completing the cognitive learning outcomes of the product.

The effectiveness of a teaching material is usually seen from the potential effects in the form of quality of learning outcomes, attitudes, and motivation of students. There are two aspects of effectiveness that must be met by a teaching material. namely:

1. Experts and practitioners based on their experience stated that the teaching material was effective.

2. Operational teaching materials provide results as expected. [9]

Existing teaching materials used today require renewal that adapts to the learning needs of the globalization era that makes students more active learning so that learning can be carried out at any time by using teaching materials that are more comfortable to use to hone students' knowledge based on technology in the revolutionary era industry 4.0 which hones students' abilities.

Existing teaching materials and used today require renewal that adapts to the learning needs of the globalization era that makes students more active learning so that learning can be carried out at any time by using more comfortable teaching materials. This teaching material is used to hone students' knowledge based on new literacy in the industrial revolution 4.0 era which hones the ability of students to be able to have big data literacy, technological literacy and human literacy. Therefore, to face challenges in this globalization era, technology-based teaching materials are developed, one of which is the Macromedia Flash application. This teaching material based on the results of the study obtained very valid, practical, and very effective criteria so that it is expected to be one of the teaching materials that can help students learn independently and be able to understand and face the challenges of globalization era competition.

IV. CONCLUSION

Based on the results of research and data analysis, it can be concluded that: (1) the Biology Learning Media Based On Macromedia Flash is high validity category (2) the practicality a Biology Learning Media Based On Macromedia Flash is practical and 3) effectiveness of Biology Learning Media Based On Macromedia Flash is high effective.

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