Developmental Scratch-Based Online Learning Media in Dynamic Electric Dynamic Topic to Increase Students Concept Understanding in Students Junior High School

Noftiana, Muhammad Nasir, Nur Islami
Physics Education – FKIP, Universitas Riau
Jl. HR. Soebrantas, Km. 12.5, Pekanbaru, 28293, Indonesia
Mifthahullana.syarifah@gmail.com

Abstract. The purpose of this research is to design and develop learning media, test the validity and reliability of the media and know the effectiveness of scratch-based online learning media on dynamic electrical materials in improving understanding Junior high school students concept. The research and development is based on 4D model consisting of four steps, namely definition, design development, and dissemination. Methods of collecting data using questionnaires, tests and documentation. This scratch-based online Media consists of headers, menus, contents, and footers. In the header there is a title from the Web and dynamic electricity, then the Top menu consists of (home, download, video, map, about, help), while in the section "main Menu" consists of (Home, syllabus, core competencies/basic competencies, and Indicators), material (electrical current, different potential, OHM’s law and electrical resistance, and reference sections consist of material sources. To access this online media users just click on the site www.noftianatesis.com. When the site is opened then the user does not need to login first, some features are available at the address, live click and Live View visible. So it can be concluded that the research results with this program can help students to understand the concept of physics that are still abstract and students feel interested in learning to use a learning media program with Scratch-based animations.

1. Introduction
Physics learning is learning that requires proof and physical understanding (experiment). The process to prove a theory is to make a modeling with computer simulations. In their research, Tambade et.al [1] stated that: “This research showed the result that Computer Assisted Instruction was pretty much more effective than traditional teaching in students’ achievement in physics”. Use of simulation in a learning media aims to make students feel as if they are experiencing and seeing directly the physical events so as to facilitate students in forming a construction of their own understanding [2]. The advantages of computers in storing and processing data and making animations are able to make a different appearance in learning so that they can attract students' interest in learning [3]. As per the statement [4] that multimedia offers a transparent way to learn certain aspects which include text, images, sound and video. Physics is a branch of science lessons in secondary schools. At present the delivery of physics lessons still uses the lecture method learning model. When conducting a group discussion some students still speak on their own because they are not interested in the learning patterns provided.
In addition, in learning physics there are physical phenomena that require abstract thinking, and formulas that are in every concept, one of which is Dynamic Electric material. This material examines physical objects up to the order of movement of electron currents, electric charges, and electromotive forces. The process of movement of electron currents, electric charge and electromotive force in dynamic electricity cannot be seen directly in plain view. Therefore we need a media that can describe the movement of electron currents, the electric charge that is in it and the electromotive force so that it appears more clearly. Media can help learning so that the concept of learning can be conveyed to students well [5]. Now has developed a lot of learning media, one of which is using Scratch that is easy to use to make games and animations (Scratch Reference Guide). Scratch is a visual language that is by creating projects using intermediaries in the form of images [6]. The advantage of Scratch is that it is free (freeware) to download the software so that it is not burdened with licenses for its users or the makers of its derivative programs, managed by groups not by companies, can be embedded into PHP and HTML which are the language of programs used on the internet. New visual programming software such as Scratch, allows most people to participate in a variety of creative projects [7].

The Scratch website provides social media for Scratch users that allows users to share their Scratch projects, get feedback and support from fellow users and learn from projects done by other users [8]. Maloney, et.all [9] entitled "Programming by choice: urban youth learning programming with SCRATCH" can facilitate students in understanding the material provided and students are able to visualize things that are considered abstract. The research, Satria [10] also stated that the development of Scratch-based online learning media was stated as good and appropriate as alternative learning media for students.

2. Methodology
This research is a development research model 4D (fourD models) consisting of 4 stages of development namely define Design, development, and disseminate [11]. This research was conducted in SMPIT Nurul Muhajirin Batam. The population is the entire grade IX SMPIT Nurul Muhajirin Students numbering 64 people, while for the sample there are 40 people are taken randomly. For research data collection techniques using poll distribution data, test and documentation. The data in this study is primary data sourced from the results of validity, reliability and effectiveness. The instrument used to collect data is a nod of validity, reliability and effectiveness. The validity poll comes from a validation assessment sheet of 4 experts consisting of 2 lecturers and 2 teachers who teach more than 5 years, then a student response poll to the media of the learning scratch. For the reliability test is done after the vaation of comfortable instruments. Effective Data is obtained using THE Student's cognitive study results test by using The Static-Group Pretest-Posttest model.

The results of the research and the testing of validity by the overall validator on the quality aspects of material substance that includes content, pedagogic and engineering and media substance aspects that include software engineering aspects, towards the media learning Using scratch is valid. For the trial of the program by the student as a whole is good and the results of the trial program by the user (guru) as a whole is valid. The results of student response analysis on the implementation of learning with the program can be well received.

3. Results and Discussion
The results of this study are in the form of a website program that is presented online. Figure 1 shows the web media design program for scratch media. Based on the Figure. 1 above can be explained that the website is designed consist of headers, menus, content, and footer. In the header there is a title from the Web, a welcome greeting and dynamic electricity. Then in the Top menu consists of (home, download, video, map, about, help), while in the section "main Menu" consists of (Home, syllabus, core competencies/basic competencies, and indicators), material (strong electric current, potential difference, OHM's law and Electrical barriers, evaluations (questions and values) and references (reference 1 and Reference 2). In the evaluation section consists of 80 problems that are embed into the data base, each student will work on 15 problems that have been automatically
adjusted. The main point of this program is the content of animation that is explained by the material on each sub subject. Here are some of the animated image displays described by the related material concept.

Figure 1. Web Display Design

Figure 2. Material electric current strength
Research and testing of instruments by the overall validator on the quality of the material aspects that include content, pedagogic and technical aspects and media substances covering aspects of software engineering, to the media of learning Using Scratch is "valid". To test the program by the student as a whole is "valid" and the result of the program trial by the user (teacher) as a whole is "valid". The results of student response analysis on the implementation of learning with the program can be received by "good". Testing is done to determine the weaknesses and disadvantages of programs that have been made to be repaired.

Reliability Test is carried out after instrument validation is complete. By using the alpha formula, then by referring to the reliability category, it is found that learning media using scratch has a high degree of reliability with an interval of 78.00%. As for the effectiveness data obtained from the student cognitive learning outcomes test. The test is carried out in two stages, namely freetest (without scratch media) and posttest (using scratch media). Obtained an average posttest score higher than the average value of the freetest. It turns out that by using the program there is an increase in test results.

4. Conclusion
Scratch-based online learning media that has a validity value with valid criteria, scratch-based online learning medium has high reliability value with 78% interval. Scratch-based online learning media has been developed to have a good value of effectiveness used as a learning medium today, it looks at the average value of the freetest and posttest students. It turns out the postests value is higher compared to the freetest value. So it can be concluded that the research results with this program can help students to understand the concept of physics that are still abstract and students feel interested in learning using a learning Media program with Scratch-based animations

References
[1] Tambade, Popat S and Wagh B G 2011 Assessing the Effectiveness of Computer Assisted Instructions in Physics at Undergraduate Level. Eurasian Journal of Physics and Chemistry Education. 2(3), 127-136.
[2] Mayer, Richard E and Moreno R 2002 Aids to Computer-based Multimedia Learning. Learning and Instruction 12. 107-119.
[3] Puji K, Maimunah and Atma M 2019 Development of ICT-Based Mathematical Media on Linear Program Materials to Improve Motivation Learning Students, Journal of Educational Sciences. 3(2) 195-204
[4] Muller, Derek A 2008 *Designing Effective Multimedia for Physics Education*. Thesis. Sydney: School of Physics University of Sydney.

[5] Muhammad N, Rizo B P and Riwayani 2018 Design and Development of Physics Learning Media of Three Dimensional Animation Using Blender Applications on Atomic Core Material, *Journal of Educational Sciences*. **2**(2) 23-32.

[6] Kadir A and Nurcito Lukman Arif 2011 *Scratch Programming Language*. Yogyakarta: MediaKom.

[7] Peppler, Kylie and Kafai Y 2007 From Super Goo To Scratch: Exploring Creative Digital Media Production In Informal Learning. Learning, Media and Technology. **Vol. 32**, 149-166.

[8] Resnick and Mitchel 2009 *Scratch: Programming For All*. *Communications Of The ACM*. **52**: 60-67.

[9] Maloney J, Peppler K, Kafai Y B, Resnick M and Rusk N 2008 *Programming by choice: urban youth learni programming with SCRATCH*. ACM, 367–371.

[10] Satria N 2015 *Development of Scratch-Based Online Learning Media on Vibration Subjects*. Faculty of Math and Science. Malang State University: Malang.

[11] Mulyatiningsih E 2012 *Applied Research Methods in Education*. Bandung: Alfabeta. 194-195.