Development of Web Bases Inquiry Learning with the Flipped Classroom Model in Science Learning for Grade 7 Junior High School.

ABSTRAK

This research aims to produce *inquiry web -based learning multimedia* valid and effective way to improve student learning outcomes on ecosystem materials in junior high schools. This research is a development research that will be carried out in two stages (the development stage of learning multimedia and the stage of testing the results of multimedia). The product developed was validated by (how many validators) competent experts and then tested empirically using *Randomized Control-Group Pretest-Posttest Design* on (how many students) students. The research data were analyzed descriptively and statistically. The results showed that (1) *inquiry web -based learning multimedia* was declared valid with very high criteria (individual test n=3, achievement= 92%; small group test n= 9, achievement= 86%; and large group test n= 32, achievement = 79%) and (2) the increase in learning outcomes of the experimental group was significantly different compared to the control group. Based on the research findings, it can be concluded that *the inquiry web -based learning multimedia* developed is valid and effective f in improving the learning outcomes of class VII junior high school students on the material of the ecosystem of the Biology Science subject.

Keywords: Multimedia learning, web based inquiry, ecosystem

PRELIMINARY

Education is an essential and crucial element that must always be an important concern for the development of a nation (Hafeez et al., 2020) . Educators, especially science teachers, need to be more focused and creative in designing and deliver learning that leads to the acquisition of concepts to develop feasibility and life skills. (Saifulloh et al., 2012) states that qualified educators are the dominant factor in improving the quality of graduates. Therefore, teachers must be able to choose and apply various teaching methods and use learning aids and equipment to help train students' skills according to the lesson plan. Therefore, learning strategies are needed that help students understand and develop their knowledge through learning.

Utilization of Information and Communication Technology in the current era of globalization has become a basic need in supporting education (Saripudin, 2015) . However, in reality, the use of technology cannot be applied optimally by the teacher as a substitute for the conventional learning process. The learning process, which mostly uses the lecture method, can only be replaced by the use of technology in the form of *web* only when needed. This is because the learning design uses a *web form* has not been well organized so that it cannot be integrated optimally in the design of learning in schools. As stated by (Septian & Ramadhanty, 2020) that the teaching process in Indonesia still tends to be monotonous because most of the teachers are

still accustomed to using the lecture method so that students play a passive role in learning activities.

(Kherid, 2019) stated that one of the learning strategies that can be used to increase the activeness of students in the learning process, one of which is the use of media as a learning resource, is web-based learning media. In AECT 2008 (Januszewski et al., 2008) *Web based learning* is a distinctive feature of learning by using websites that are oriented towards reading, discussing, constructing knowledge, expression (through the *chat feature*), and even conducting information search activities. (Shive et al., 2004) argued that *Web Based Inquiry Learning* is a student-directed learning activity that tends to focus on a decision and the involvement of students in making decisions about how to complete an investigation.

In addition to learning media and learning resources, learning models play an important role in improving student achievement and learning independence. (Buckman et al., 2019) stated that there are four important strategies to increase student activity in learning including: (1) creating individual activities inside and outside the classroom (2) integrating students in group activities (3) inspiring informal groups, and (4) giving assignments to cooperative students. Involving these concepts with the *flipped classroom model* involves students taking part in the learning process with full concentration. This model allows students to learn more cooperatively and think critically. It also allows students to share their knowledge with group mates (Michel et al., 2009) . So that using the flipped classroom model can increase students' interest and motivation to learn actively (Lewis et al., 2018) .

Flipped classroom learning model first introduced by (Bergmann & Sams, 2012) namely in the learning process students learn the subject matter at school home before class starts and teaching and learning activities in class are in the form of doing assignments, discussing material or problems that have not been understood by students. By doing assignments at school, it is hoped that when students experience difficulties, they can be directly consulted with their friends or with the teacher so that the problem can be solved immediately (Moore et al., 2014) stated Flipped Classroom is a learning model that utilizes multimedia devices and technology to assist the process of exchanging time for delivering learning materials so that students receive most of the material content when they are working with assignments or homework that requires a lot of additional theory while in class. In the flipped classroom learning model apply a student-centered approach to the learning process so that it can train students to be more active in learning because students will construct concepts learned with their friends through discussion and concept activities The test given by the teacher (Abeysekera & Dawson, 2014) . The uniqueness of this flipped classroom learning model is in teacher

learning using web-based media assistance or Web Based Inquiry Learning as media and learning resources for technology-based students such as Learning management systems, YouTube, WhatsApp, and others (Pohl et al., 2018) (Roehl et al., 2013) .

Media development in this study focuses on one type of learning resource in the form of web-based inquiry learning materials, namely Web-based Inquiry Learning. The purpose of product development that utilizes the rules of learning technology is as a function of developing learning resources and to overcome one of the inhibiting factors for the learning process in science subjects at SMP Negeri 4 Krui Lampung. In the end, learning barriers, especially those related to limited learning resources, are expected to be overcome.

Similar research has been carried out but not specifically about the development of web based inquiry learning with the flipped classroom model, including research conducted by (Shabrina & Diani, 2019) Development of Web-Based Physics Learning Media Enhanced Course with Guided Inquiry Model, (Khofifah et al., 2021) , and (Januarisman et al., 2016) Development of Web-Based Learning Media for Natural Science Subjects for Class VII Students.

RESEARCH METHODS

This research is a Research and Development (R&D) research. According to (Gall et al., 2007) Development research is a type of research that has the prospect of developing and validating products used in education.

A series of development steps that must be passed as revealed by (Gall et al., 2007) are initial research and information gathering, planning, initial product development, initial product trials, major product revisions, main product trials, operational product revisions, operational product trials, final product revisions, and dissemination and implementation. Of the ten stages developed by Borg and Gall, in this study the implementation only reached the seventh step (7). This was done due to limitations, both in terms of time and cost in this study. (Sugiyono, 2011) states that research and development can be stopped until a final draft is produced, without testing the results. The steps of the development procedure can be seen in Figure 1.

Figure 1. Borg & Gall Development Procedure Steps

The trials in this development include: 1) trial design, 2) test subjects, 3) types of data, 4) data collection instruments, and 5) data analysis techniques. The trial design was basically carried out as a formative evaluation step consisting of content expert trials, learning media expert trials, individual trials, small group trials, and large group trials.

The research design used in this study was the *Randomized Control-Group Pretest-Postest Design* as a real experimental research development design (Sumadi, 2018) . In this design, pre-test and post-test were given to both the experimental group and the control group. The experimental group is the group that is given treatment using *web based inquiry learning* with the *flipped classroom model* in the learning process, while the control group used conventional learning with the lecture method. The research design is presented as in Table 1.

Table 1
Randomized Control-Group Pretest-Posttest Design

	Group	Pre-Test	Treatment	Final Test
R	Experiment	T1	X	T2
	Control	T1	-	T2

Source: (Sumadi, 2018)

Information :

T_1 = *Pretest*, to determine the students' initial mastery of knowledge about the material before being given treatment.

T_2 = Final test *(posttest)*, to find out students' mastery of knowledge about the material

X = Treatment, namely the implementation of learning using learning tools *web based inquiry learning with flipped classroom* model.

- = Not given conventional treatment / learning.

(Sumadi, 2018) explained that the procedure in this experimental design began by selecting subjects at random from the population. Then grouped into experimental and control groups. Both groups were given a pretest to measure the dependent variable of the two groups and then the mean of each group was calculated. After that, give a posttest to both groups and calculate the mean of each group. Calculate the difference between the results of the pretest of the experimental and control groups and the posttest of the experimental and control groups. Apply suitable statistics to determine the difference from the calculation of the difference, to draw a conclusion whether the difference is large enough to reject Ho.

The subject of the trial is the target user of the development product, namely students at the junior high school level. The target students are devoted to junior high school students class VII Junior High School. The selection of target students is based on: (1) Junior high school students class VII take science subjects. (2) Class VII junior high school students are willing to provide data that will later be needed in the development of this learning multimedia. (3) The school has given permission to conduct research on the development of this learning multimedia. This target trial requires 3 students for individual trials, 9 students for small group trials, and 32 students for large group trials (field testing).

The data from this experiment are in the form of quantitative data and qualitative data. Quantitative data were obtained from questionnaires distributed to test subjects, while qualitative data in the form of responses and suggestions for improvement were obtained from interviews. The data are collected through a series of formative evaluations which are differentiated according to their functions, namely: (1) The first stage of evaluation data is in the form of evaluation data and reviews from experts, (2) The second stage of evaluation data is in the form of data from small group trials, (3) The third stage of evaluation data is in the form of data from large group trials (field tests).

Data collection instrument on web based inquiry learning development with flipped classroom model consists of: (1) Questionnaire to obtain data regarding opinions and comments from the test targets regarding the developed learning tools. This questionnaire sheet was given

to experts, students during small group trials and large group trials. The questionnaire given to the experts is to get data about the responses to the product design. While the questionnaire given to students aims to find out the responses of students regarding the effectiveness of the learning media presented to them. The grid for the preparation of the instrument shows the relationship between the variables studied and the data source (Arikunto, 2013); (2) Learning outcomes test, this instrument is used to measure the ability of students to master knowledge in subject matter. This test result is used to determine the completeness of achieving the specific learning objectives that have been determined in the previous learning multimedia development process. The test was administered twice, namely before learning (pretest) and after learning (posttest).

Before the learning outcomes test instrument is used in the pretest and posttest, the test instrument will be tested for validity first, the validity of the test. If the instrument is said to be valid, it means that the measuring instrument used to obtain the data is valid so that the instrument can be used to measure what should be measured (Sugiyono, 2019) . Testing the validity of the test is to correlate each item score using the Pearson Product Moment. In addition to testing the validity, the test instrument used will also be measured for reliability. Testing the reliability of the test using the Split Half Method (Riduwan, 2004). The statistical analysis conducted by using SPSS for windows software.

The data analysis technique used to process data from the results of expert reviews, small group trials and large group trials uses descriptive qualitative analysis. Qualitative descriptive analysis was used to process data from expert *reviews* and data from trials on seventh grade junior high school students. This data analysis technique is used by grouping information from qualitative data in the form of responses, criticisms, or suggestions for improvement contained in the questionnaire. The table is used to classify the level qualifications that have the criteria as presented in Table 2.

Table 2
Achievement Rate Conversions on a 5. scale

Level	Qualification	Information
85% - 100%	Very high	No need to revise
75% - 84%	Tall	No need to revise
65% - 74%	Enough	Revised
55% - 64%	Not enough	Revised
0 – 54%	Very less	Revised

FINDINGS AND DISCUSSION

The expected product from the development of *web based inquiry learning* with the *flipped classroom model* This includes a learning website page that has met validation from media experts and website material experts which will be explained in detail about the product components in the table 3.

Table 3
Product Specification

No	Product Components	Product specifications
1	Media	*website* that is easy to use by students
		Has facilities for comments about materials and *chat facilities*
		The product has been validated by media experts
2	Website Material	The materials presented include: 1. Text based material 2. Video tutorial material made in accordance with *inquiry learning* and can be downloaded on *YouTube.* 3. Supervision material is in the form of multiple choice practice questions. 4. Menu *link* that is connected to a *website address* that has been chosen by the educator
		Have content validity and input from material experts
		Materials are developed based on basic competencies and *inquiry - based*
3	Strategy approach	The model used is the model *Flipped Classroom* is a learning model where students learn material at home via the internet and then in class, students and educators discuss things that students do not understand.
		Virtual/ internet learning: Virtual/ internet learning: 1. Students learn the material first at their respective homes through a *website* designed by educators before the teaching and learning process in class. 2. Students work on practice questions available on *the website.* 3. Students give comments or ask the teacher about the material with the comment column facility.
		Face-to-face learning in class: 1. Discuss materials that have not been understood by students. 2. Direct practice of the material that has been learned through *the website.* 3. Evaluation
4	Evaluation	The evaluation instrument is in the form of practicum criteria that have been determined by the educator and carried out during face-to-face meetings.

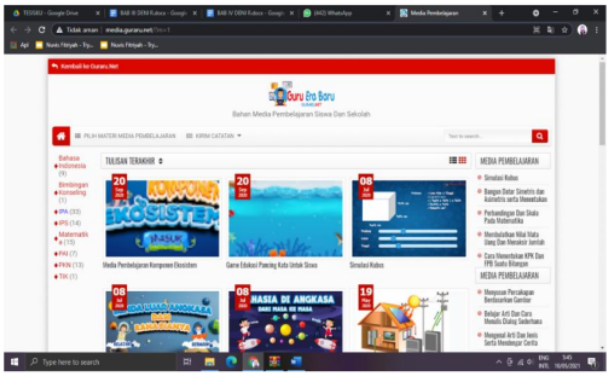
Table 4
Product Developer Components

No	Supporting Components	Information

1	*Software* (Software)	1. The CMS (*Content Management System*) application used in this development is the *google site* 2. Learn.id account as *database.* 3. The teacher is an admin so that he can add and remove material from *the website.* 4. *Browser* application to be able to access *websites* such as *google, chrome, mozilla firefox, opera, internet explorer* etc
2	*Hardware* (Hardware)	1. *Smartphones use both Android, iOS* and *Windows* operating systems. 2. Internet network (data package). 3. Teacher's guide book as an admin to manage *the website.*

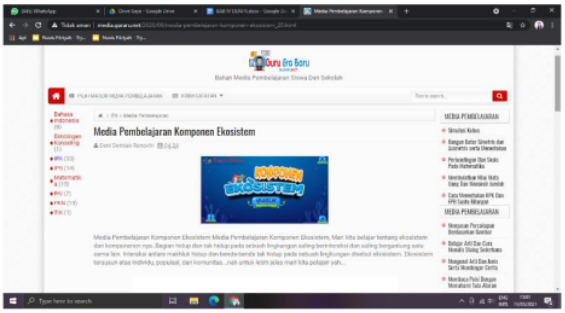
Here is the link to the web page: https://sites.google.com/guru.sd.learning.id/ruangsiswa . How to use media, for students https://sites.google.com/guru.sd.learning.id/ruangsiswa/beranda until the following display appears:

Figure 2
Display of inquiry web-based learning multimedia



Then students are directed to choose the appropriate learning media with the learning material and then click until the main screen appears

Figure 3
Main display of multimedia description entitled Ecosystem Components



web based inquiry learning multimedia with the *flipped classroom model* This is accessible on smartphones, so users, both students and teachers, can access it only by opening the web link provided and can be accessed even using a smartphone, so that when conducting face-to-face dissemination.

navigation buttons (menus) to make it easier for users to choose the material to be delivered. The button is made using interesting visual effects and sound, where the button will sound and move when the mouse cursor is hovered over the button. There is also a multimedia *backsound* that can be *on/off* to turn off or turn on the narration sound.

Based on the results of the content or material expert's assessment of learning multimedia products, it was found that *the web-based inquiry learning* model with the *flipped classroom model* for science subjects on Ecosystem material had no notes for revision of the media. However, there are some notes for developers including the need to make accompanying materials for teachers and students, Multimedia learning *web based inquiry learning* with a *flipped classroom model* for science subjects, ecosystem materials are suitable for use in learning.

multimedia was tested on 3 respondent trials. Individual trials, on 3 respondents obtained an average assessment of the feasibility of learning multimedia *web based inquiry learning* with the *flipped classroom model, the* percentage is 92% with a "very high" qualification so there is no need for revision or improvement, in a small group carried out on 9 respondents, the average percentage is 86% with 'high' qualifications so there is no need for revision. In the large group of 32 respondents, an average percentage of 79% was obtained, this value was in the 'high' qualification so that there was no need for improvement. The data is presented in table 5.

Table 5
Data on Trial

No	Question	Percentage (%)		
		Individual	Small Group	Big Group

1.	Multimedia capabilities of *web based inquiry learning* with the *flipped classroom model* shown are able to convey science subject matter well	100	91	83
2	Clarity of the content of multimedia learning materials *web based inquiry learning* with the *flipped classroom model*	100	89	81
3	Clarity of practice questions on multimedia learning *web based inquiry learning* with the *flipped classroom model*	93	84	78
4	The ability of practice questions and answers to improve your understanding of the subject matter presented	93	84	79
5	The structure of presenting the multimedia ecosystem material for *web based inquiry learning* with the *flipped classroom model* to facilitate learning	87	87	79
6	Giving animation is able to facilitate understanding of ecosystem material	87	96	83
7	The addition of a simulation can make it easier to understand ecosystem material	87	87	79
8	The attractiveness of audio (music, sound effects) in multimedia learning *web based inquiry learning* with the *flipped classroom model*	87	80	77
9	Clarity of text display and written form (*font)* in multimedia learning *web based inquiry learning* with the *flipped classroom model*	93	80	78
10	The attractiveness of the combination, arrangement, and color selection in *web based inquiry learning multimedia* with the *flipped classroom model*	93	80	76
Overall percentage average		92	86	79

From the statistical test using the *independent sample t-test,* the *pretest data for* the control class and the experimental class showed an average value of 50.6531 and 47.3156, respectively. The mean value that is not significantly different indicates that the two classes have the same ability. Furthermore, the *posttest data of* the control class and the experimental class showed an

average value of 60.7031 and 70.7500, respectively. of the two posttest average values, it shows an increase in the value of the two classes, but the increase in scores is significantly different where the experimental class uses *web based inquiry learning multimedia* with the *flipped classroom model.* have a higher value. Thus it can be said that multimedia learning *is web based inquiry learning* with the *flipped classroom model* This is effectively used and can improve student learning outcomes. The following is a test of the similarity of the two averages of the *pretest and posttest* using the *independent sample t-test* on SPSS 16.

Table 6
The output of the similarity test of the two pretest averages of the control and experimental classes

Group Statistics

	Group	N	mean	Std. Deviation	Std. Error Mean
PreTest	Control	32	50.6531	12.08246	2.13590
	Experiment	32	47.3156	11.13484	1,96838

Table 7
The output of the similarity test of the two posttest averages of the control and experimental classes

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Post Test	Kontrol	32	60.7031	8.70578	1.53898
	Eksperim	32	70.7500	8.58521	1.51766

Based on the results of an expert assessment of learning multimedia products, it was found that multimedia *web-based inquiry learning* with a *flipped classroom model* for science subjects on this Ecosystem material, is suitable for use in learning, as stated by (McKimm et al., 2003) that web-based learning makes it easier for students to learn and provide wider access to the acquisition of knowledge and information.

Meanwhile, based on the product effectiveness test, it shows that the group of students in the learning process using *web based inquiry learning* with the *flipped classroom model* is more effective in improving learning outcomes than the group of students in the conventional learning process using the lecture method, as stated by (Saira et al.., 2021) that the *flipped*

classroom model is a more effective teaching strategy compared to conventional teaching methods, where the *flipped classroom model* is a learning strategy that can increase students' self-efficacy in learning compared to the lecture method. Furthermore (Albalawi, 2018) states that the *flipped classroom model* is a learning approach through project-based learning, student-centered learning, problem-based learning and inquiry-based learning that emphasizes students' active participation in the learning process.

CONCLUSIONS AND SUGGESTIONS

Based on the research results obtained during the process of developing and testing multimedia learning products based on *web inquiry* on the ecosystem material for Science Biology lessons for class VII SMP Negeri 4 Krui, the following conclusions were obtained: In expert trials, learning materials were suitable for use in learning.

multimedia was tested on 3 respondent trials. Individual trials, on 3 respondents obtained an average percentage of 92% of the assessment on the feasibility of multimedia *web-based inquiry learning* with "very high" qualifications, in a small group carried out on 9 respondents an average percentage of 86% with 'high' qualifications was obtained. In a large group of 32 respondents, an average percentage of 79% was obtained, this value was in the 'high' qualification. So that the Inquiry Web-based Multimedia used with the Flipped Classroom learning model is feasible to use to improve science learning outcomes in class VII SMP.

From the statistical test of the average value data in the control class and the experimental class, it can be seen that after the learning process the *posttest was carried out* which showed an increase in the value of the two classes, but the increase in value was significantly different where the experimental class using multimedia *inquiry web -based learning* had a higher score.. Thus it can be said that this *inquiry web -based learning multimedia* is effectively used and can improve student learning outcomes.

inquiry web -based learning multimedia products is that in using this product, evaluations of the material should be carried out both in theory, pictures, animations and simulations because the development of science is always new with notes that do not deviate and still refers to the Curriculum Standards that has been set by the government.

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