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Validity and Practical of Flipped-Guided Inquiry Based Learning on Coloid System for 11th Grade High School Students

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Abstract— **The outbreak of Coronavirus (Covid-19) in Indonesia on March 2020 caused a shift in the learning system from face-to-face to online learning. As a result of the implementation of this online learning system, students are required to stay being active in the learning process and teachers are also required to be able to create student-centered learning in accordance with the demands of the 2013 curriculum. Therefore, a study that aimed to assist teachers in providing a learning system is needed. Flipped classroom guided inquiry based on student-centered colloidal system material and tested the level of validity and practicality of the developed learning system is needed. The type of this research is Research and Development (R&D) with a plomp development model. The results showed that the learning system was valid according to expert judgment with a V value of 0.82 and very practical with a practicality percentage of 88% in terms of distributing practicality question from 15 students.**

Keywords— Flipped Classroom, Guided Inquiry, Colloidal System

I. INTRODUCTION

The outbreak of CoronaVirus (Covid-19) has plagued more than 215 countries in the world, and has given its own obstacle in various fields, especially in the field of education. In dealing with the spread of Covid-19, the Ministry of Education and Culture made a decision to prevent the spread of the corona by imposing an online learning system (1).

One of the learning models that utilize technology that we can use in online learning is blended learning. Blended learning is a combination of face to face learning (traditional) with online learning (2). Blended learning can also be interpreted as a learning model that combines two learning systems, synchronous and asynchronous (3). In the implementation of blended learning, one of the models that can be used is the flipped classroom. flipped classroom can also be interpreted as an upside down classroom. flipped classroom is a learning model that reverses learning that is carried out in the classroom into learning that is carried out outside the classroom (4).

In scientific learning, there are several learning models that can be used to carry out the learning process, one of which is the guided inquiry learning model. The guided inquiry learning model is a learning model where students can build their own understanding by connecting the knowledge they have previously acquired (5). In this model, students have the opportunity to discuss with group friends in solving a problem and can improve students' ability to find concepts from various sources in their group (6). The guided inquiry learning model is actually a learning model that directs students to think critically in accordance with

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the demands of the 2013 curriculum (7). The guided inquiry steps include orientation, exploration and concept formation, application and closing (8).

FGIL learning emphasizes the process of student discovery while analyzing the model and finding a concept independently which is facilitated by the teacher (9). In addition, in FGIL learning students can also collaborate with their group friends in finding common concepts and can brainstorm at the closing stage (10).

Fadloli (2019) conducted a study on the development of learning model Blended Learning an Edmodo-basedfor effective chemistry learning, concluding that this learning model is feasible to be applied as a learning medium with a feasibility percentage above 75% using the Linkert scale on redox material and compound nomenclature.

Research conducted by (11) in his research on "The Effect of Using Guided Inquiry-Based Worksheets on Student Learning Outcomes" concluded that the use of guided inquiry-based worksheets increased students' interest in learning because of the model in the form of macroscopic and microscopic images accompanied by attractive color. Besides, the use of guided inquiry-based worksheets also has a positive influence on student learning outcomes in the sample class compared to student learning outcomes in the control class.

Based on the above background, the researcher conducted a study on an FGIL learning system on Colloidal System material for class XI SMA/MA. This learning system is expected to be a solution in the implementation of online learning and other special conditions in the 4.0 era where students remain active, creative and innovative in carrying out learning activities, in accordance with the demands of the 2013 Curriculum. FGIL learning model uses the Learning Management System. (LMS) Edmodo and Zoom Meeting.

II. METODOLOGY

Type of research used in this research is Research and Development (R&D) with a plomp development model. The plomp development model is carried out by following 3 stages, namely the first stage of Prelimenery Research, namely the initial investigation stage. The second stage is the Prototyping Phase, namely the development stage or prototype making. The third stage is the Assessment Phase, namely the assessment stage or the practicality test stage (12).

In the stage, the Preliminary Research researchers identified and analyzed the necessary research to develop the learning system Flipped Classroom based on Guided Inquiry. At this stage, several analyzes were carried out, namely needs analysis and context analysis, literature study, and analysis of conceptual framework development. Needs analysis is carried out with the aim of looking at the situation and conditions in the field related to the learning process in chemistry lessons at school, while context analysis is carried out with the aim of seeing a real picture of conditions in the field, and to find solutions to the problems found in the needs analysis. conducted a literature study with the aim of finding and understanding sources related to the development being carried out.

At the prototype stage (Development or Prototyping Phase) a formative evaluation is carried out which is divided into 3 stages. The first stage of the self-evaluation(self-evaluation)is generated through the first prototype and produce a prototype 2. Second expert assessment (expertreview) by 3 validator of the prototype 2, while the evaluation of one to one interviews with three students in class XI. The results of this evaluation revision produce a prototype 3. Results of an evaluation prototype 3 small groups (small group).Evaluation group(small group)conducted on 15 students of class XI to give the practicalities questionnaire to determine the practicality of prototype 3. If still needed improvements to the prototype 3 then revised in accordance with the needs and produced a prototype 4.

At the stage of assessment (Assessment Phase) a field test is conducted to obtain the level of practicality of the product being developed. After all stages have been carried out, validity data and practicality data are obtained through the distributed questionnaires. The validity data were analyzed using the Aiken Scale,

$$V = \frac{\sum s}{n(c-1)}$$

Where, V is the Aiken Scale, s is the difference in the score given by the validator with the lowest score in the category applied, n is the number of validators, and c is the highest number in the validity assessment. If the value of V≤ 0.4 means the product is

said to be less valid, if 0.4 < V < 0.8 then the product is valid, and if the value is 0.8 < V then the product developed can be said to be valid. Mean while, the practical analysis was carried out by giving questionnaires to teachers and students (13).

III. Result And Discussion

Result

At the stage Prelimenery Research , a needs analysis was carried out conducted at SMAN 8 Padang, it is known that there is a change in the chemistry learning system from face-to-face to learning online. Besides the implementation of learning system online, students are also required to remain active in the learning process and teachers are also required to be able to create student-centered learning in accordance with the demands of the 2013 curriculum. Context analysis is carried out with the aim of seeing a real picture of conditions in the field, and to find solutions to the problems found in the needs analysis.

Furthermore, literature studies related to learning systems that can be applied tolearning are carried out online today. One of the learning models that can be used is blended learning. Blended Learning is learning that combines two systems, systems asynchronous and synchronous appropriately in meeting a learning goal (14). In the implementation of blended learning, one of the models that can be used is the flipped classroom. According to Johnson (2013), Flipped Classroom is learning that increases indirect learning with the help of media online that can be accessed by students and reduces direct learning by teachers.

Guided inquiry learning is learning in formulating findings in searching and investigating systematically involving all students' abilities. Through observing activities and collecting data in drawing conclusions, students are actively involved during learning, where students will conduct experiments in finding a concept (15). In guided inquiry, students are directly involved in determining a concept and making their own conclusions about the material being studied. (16).

After doing a literature study, a conceptual framework analysis was carried out. Based on the literature study to overcome the problems that are being faced by teachers and students, the researchers developed an Flipped-Guided Inquiry based learning system online that remains student-centered with the teacher as a facilitator.

The steps for develop the Flipped-Guided Inquiry based learning system:

Figure 1. Flipped-Guided Inquiry based learning cycle of Aumi & Mawardi (2021)

At the orientation stage, the teacher uploads an orientation video that h made himself on Edmodo. The orientation video contains motivation, appreciation and learning objectives that must be achieved by students. Orientation videos that have been given by the teacher can be accessed by students anytime and anywhere through the Edmodo application.

The next stage is exploration and concept formation. At this stage students are given a model or information guided by key questions that serve to direct students to find a concept independently. Key questions are made to relate to each other starting from simple questions to complex questions.

Application stage. The application stage is the stage of strengthening and strengthening the concept. At the application stage, students are given exercises and questions. In practice students can do it in groups while in answering questions students must do it independently. This application stage aims to provide reinforcement and as a benchmark whether students have understood the concept or not.

Closing stage. The closing stage is learning synchronous using the application Zoom Meeting. At this stage students will make conclusions, present the results of their group work with other group friends through group representatives. The purpose of this application stage is to find out whether the learning indicators have been achieved or not.

stage Prototyping (Development or Prototyping Phase). The learning system developed is the FGIL learning system with 2 learning models, namely synchronous and asynchronous. Learning Asynchronous includes the orientation phase, exploration and concept formation, as well as the application phase. While the synchronous stage includes the closing stage.

After the prototype 1 is produced, a self-evaluation of the prototype 1 is carried out. Evaluation is done by looking at the completeness of the components that must be available in Flipped-Guided Inquiry based learning system that is being developed. After revision, prototype 2.

In prototype 2, expert assessment and evaluation were carried out one-to-one on 3 students. In the evaluation one-to-one through interviews, it was found that the language and sounds contained in the orientation video were clear. The model and key questions contained in the exploration stage are clear and can lead students to find concepts. In the expert assessment, validity tests were carried out by 3 validators on the aspects of the feasibility of content, presentation, language and graphics of the Flipped-Guided Inquiry based learning system that was being developed. The validity test obtained a value of 0.82 with a valid category. Data validation results can be seen in the following table:

Table 1. Results of Validity According to the Expert Assessment

No	Aspects Assessed	V	Category of Validity
1	Content Feasibility	0,8	Medium
2	Construction Feasibility	0,83	Valid
3	Linguistic	0,83	Valid
4	Graphics	0,83	Valid
Average		0,82	Valid

After the evaluation of one to one and an expert assessment of the prototype 2 then be revised and produced a prototype 3. In the third prototype evaluation small group (Small Group) against 15 students of class XI. Evaluation is done by giving a practicality questionnaire with the aim of seeing the practicality of the product being developed. This practicality test was conducted to see the ease of use, time efficiency and benefits of the developed product. This practicality test data obtained an overall percentage value of 88% with a very practical category. Practical results data can be seen in the following table,

Table 2. Evaluation Practicality Results Small Group

No	Aspects Assessed	Persentase	Category of Practicality
1	Ease of Use	86%	Very practical

2	Time efficiency	89%	Very practical
3	Benefits	88%	Very practical
Persentase keseluruhan		88%	Very practical

Discussion

From table 1, the validation data of the Flipped-Guided Inquiry based learning system obtained a V value of 0.82 with a valid category. This means that the Flipped-Guided Inquiry based learning system on colloidal system for class XI SMA/MA developed has been valid according to expert judgment.

In terms of content feasibility, the product obtained a V value of 0.8 with a medium category. This means that the orientation video contains material that is in accordance with the material or indicators that will be achieved by students, the model used is scientifically correct and the key questions used in exploring the model are in accordance with the material to be studied and can help students find concepts. Questions in the exercises at the application stage in Edmodo also help students in strengthening concepts.

In terms of presentation feasibility, the product obtained a V value of 0.83 with a valid category. This means that all stages of Flipped-Guided Inquiry based learning system follow/contain all the syntax of guided inquiry learning. The Edmodo application also makes it easier for students to access learning where the orientation video contains images and sound of good quality, the presentation of the model accompanied by key questions at the exploration and concept formation stage is presented from the simple to the complex, the presentation of the comment column at the application stage allows students to can discuss with their group of friends, as well as the use of the application zoom at the application stage to carry out learning synchronous in confirming concepts and presenting answers to other groups.

In terms of language, the product obtained a V value of 0.83 with a valid category. This means that the language used in the orientation video, key questions and exercises contained in Edmodo is in good and correct Indonesian.

In terms of graphics, the product has a V value of 0.83 with a category of 0.83 with a valid category. This shows that the model used in the exploration and concept formation stage in Edmodo can be clearly observed by students.

The Flipped-Guided Inquiry based learning system on the colloid system developed has a practical value of 88% with a very practical category. In terms of ease of use, it has a practicality value of 86% with a very practical category. This shows that the steps of the Flipped-Guided Inquiry based learning system are easy to understand, the model and key questions and the language used are easy to understand and understand by students.

In terms of time efficiency, the product has a practicality value of 89% with a very practical category. This shows that students' learning time using this learning system becomes more efficient but students can still learn according to their own learning pace.

In terms of benefits, the Flipped-Guided Inquiry based learning system on colloidal system has a practical value of 88% with a very practical category. This means that by using the Flipped-Guided Inquiry based learning system, students are easier to understand a concept. The model used can help students answer key questions and help students understand the colloid concept easily. Key questions that start from simple questions motivate students to answer more complex questions, making it easier for students to understand the concept of colloids. The exercises contained in Edmodo can train students' conceptual understanding and can strengthen students in understanding the colloid concept. The Flipped-Guided Inquiry based learning system on colloidal system is said to be able to increase students' interest and activity in learning.

Based on the description above, the Flipped-Guided Inquiry based learning system on colloidal system for class XI SMA/MA students can be said to be valid with a V value of 0.82 and very practical at a practicality value of 88%.

IV. CONCLUSION

Based on the research that has been done, it can be concluded that the Flipped-Guided Inquiry based learning system on colloidal system for class XI SMA/MA, shows that the learning system has been valid according to expert judgment with a V value of 0.82 and is very practical with a practicality percentage of 88. % in terms of distributing practicality questionnaires to 15 students.

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