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Validity And Practicity Of Flipped Guided Inquiry Based Learning (FGIL) Model In Chemical Kinetics For Year 1 Students

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Abstract – This research was motivated by the Covid-19 virus pandemic that has hit globally, including Indonesia. The pandemic that occurred caused the learning system to be shifted to an online system. The challenge faced by teachers in online learning systems was the teachers have to think about an appropriate learning to be done with an online system. This study aims to develop and reveal the level of validity and practicality of the Flipped-Guided Inquiry Based Learning (FGIL) model which developed for learning in tertiary institutions. The type of research undertaken was Educational Design Research (EDR) with the Plomp development model. The subjects of this study were chemistry lecturers at Padang State University (UNP) and chemistry students who are studying general chemistry. The instruments used were the validation sheet to test the validity, and the practicality sheet to test the practicality. The validation was carried out by 4 chemistry lecturers and one to one by 3 students. The practicality test was carried out on 40 1st year students taking general chemistry courses. Analysis of the validity and practicality data, the value for the validity test was 0.85 with the valid category, and the practicality test was obtained for 0.82 with the very high practicality category. The results show that the FGIL model is valid, practical and effective and can be applied by lecturers in lectures.

Keywords – *Guided Inquiry*, *Flipped Classroom*, FGIL, Chemical Kinetics.

I. INTRODUCTION

The Covid-19 pandemic has hit almost all over the world, including Indonesia. The impact of the Covid-19 pandemic has caused changes to the learning system. This is a decision from the Indonesian Ministry of Education which states that the learning process during the Covid-19 pandemic is carried out from home or what is called as distance learning (online) (1,2). In online learning, the challenge faced by teachers is that they have to think of appropriate learning to stimulate students to take online lectures (3).

Learning that can be used in online learning systems is *blended learning*. Learning with system *blended learning* has two learning setting, they are synchronous and asynchronous (4). One part of *blended learning* is *flipped classroom* (5). Learning with the flipped classroom system is learning by reversing what usually happens in the classroom and outside the classroom.

In the learning process, students are required to be active in learning. One learning model that can increase student activity is guided inquiry learning model. Learning with the guided inquiry model familiarizes students with solving problems, thinking critically and achieving understanding independently, so that students can be actively involved in the learning process (6).

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Based on the background above, this study conducted a research on the development of the Flipped Guided Inquiry Based Learning (FGIL) model on chemical kinetics material for year 1 students. This model is expected to be effective for learning with online systems during the pandemic and other special conditions as well as support for learning in era 4.0. In the designed learning model, the learning process uses supporting facilities in the form of the *Learning Management System* (LMS), namely Edmodo and *Zoom Meeting*.

II. METHODE

Type of research carried out was *Educational Design Research* (EDR) with the Plomp development model, the stages are; *preliminary* research, *development or prototyping phase* and *assessment phase* (7). This paper is only limited to the stages validity and practicality of the FGIL model on chemical kinetics material for year 1 students.

In *preliminary research* stage, needs and context analysis were carried out, literature studies and conceptual framework development. Context analysis is carried out by looking at the description of conditions in the field related to the learning process in the General Chemistry course. The needs analysis is done by analyzing the General Chemistry semester learning plan (RPS). Literature studies are carried out to find and understand sources related to the development that will be carried out, and find solutions to problems through scientific journals. Furthermore, based on the problems that have been identified and linked to some existing theories, a framework of thinking is developed.

In the *development or prototyping phase, a* micro research cycle is carried outnamely analysis, designing, evaluation and revision. At this stage, after designing prototype 1, a formative evaluation is then carried out. The formative evaluation was carried out in the form of a *self-evaluation* whose revision results resulted in a prototype 2. Furthermore, *expert review* and *one to one evaluation,* which aimed to determine the validity of the model developed. Validation was carried out by 4 chemistry lecturers, and one to one evaluation was by conducting interviews with 3 chemistry students. After being revised, it will produce a prototype 3. Then carried out with *small group evaluation is* on prototype 3, namely by conducting trials on 6 students and the results of the revisions will produce prototype 4.

In the *assessment stage*, a field test is carried out, namely a field trial of the resulting prototype 4. Field trials were conducted on 40 students who were taking general chemistry courses. At this stage, the practicality test of the developed model is carried out.

III. RESULTS AND DISCUSSION

Results

In preliminary research stage can be seen that general chemistry lectures are conducted online, due to the current pandemic condition. In general chemistry courses, one of the materials studied online is chemical kinetics. After conducting a literature study, it can be seen that for emergency learning during the Covid pandemic, it can be done by implementing *flipped classroom* learning, and guided inquiry learning can be transferred to the online system. Thus a learning model was developed that combines guided inquiry learning with the flipped classroom system, which is called the *Flipped GuidedBased Learning* Inquiry(FGIL) model. The following are the stages of learning the FGIL model.

Figure 1. The FGIL Learning Cycle

In the *development or prototyping phase*, what is done is making a prototype. The things done first to make prototype 1 are 1) design learning using guided inquiry, 2) determine a model that is in accordance with the learning objectives (models can be in the form of images, graphics, data tables, videos, etc.), 3) make questions keys that are tailored to the expected concepts and are based on the model, 4) create questions and exercises, and 5) concentrate to the part of the guided inquiry syntax in Edmodo.

The learning model developed is guided inquiry learning which presented in *flipped classroom*. Learning contains two learning settings, namely asynchronous and synchronous. Asynchronous learning is carried out at the stages of preparation, orientation, and exploration and concept formation. Meanwhile, synchronous learning is carried out at the application and closing stages. The orientation stage as well as exploration and concept formation were carried out using Edmodo LMS, while the closing stage was carried out using a *zoom meeting*.

The resulting prototype 1 was then *self-evaluated*. From the *self-evaluation it* can be seen that there is still 1 component that is not in the prototype 1. Furthermore, the prototype 1 revision is carried out. The results of the revision of prototype 1 are called prototype 2. The resulting prototype 2 is then carried out to *one to one evaluation* which is carried out on three students. From the results of the *one to one evaluation, it* can be seen that the voice on the orientation video, the language used and the key questions given are clear and can be understood by students. From the results of the interview, the suggestions given by students were that the model (image) needed to be added some more information that made it easier for students to explore images. In prototype 2, validation was also carried out by an *expert review*. From the validity test, it is known that the value obtained is 0.85 in the valid category. This indicates that in terms of content feasibility, construction, language and graphics the FGIL model developed has a valid category. The revised results from *one to one evaluation* and assessment by *expert review* resulted in a prototype 3.

Table 1. Validity Results According to *Expert Review*

No	Aspects Assessed	Values	Category
1	Content Feasibility	0.86	Valid
2	Construction Feasibility	0.87	Valid
3	Linguistic	0.85	Valid
4	Graphics	0.81	Valid
Average		**0.85**	**Valid**

The resulting prototype 3 was then subjected to a *small group evaluation. This small group evaluation* was conducted on 6 students, the aim of which was to see the practicality of the resulting FGIL model. From the test, it can be seen that the practicality value obtained is 81 with the very high practicality category. Based on the opinions given by students during *small groups, it is* known that learning carried out using the FGIL model can motivate and help students in learning. The results of the revision of the prototype 3 resulted in a prototype 4.

Table 2.Practice Results of Small Group Evaluation

No	Aspects Assessed	Percent Value (P)	Practicality Criteria
1	Ease of use	79	High
2	Time efficiency	82	Very High
3	Benefits	81	Very High
Average		**81**	**Very High**

In the Assessment Phase, a field test was carried out on prototype 4. This stage is also called a field test which aims to obtain a final opinion regarding the practicality of the model being developed. The test was conducted on 40 chemistry students and 2 general chemistry lecturers. From the test, it was found that the student practicality was 82 with the very high practicality category. While the practicality of the lecturers is 85 with a very high practicality category.

Table 3. Results ofPracticality Field Test Student

No	Aspects Assessed	Percent Value (P)	Practicality Criteria
1	Ease of use	82	Very High
2	Time efficiency	80	Very High
3	Benefits	84	Very High
Average		**82**	**Very High**

Discussion

The learning model is a general pattern of learning behavior to achieve the expected learning outcomes (8). The learning model is also a plan or pattern (which can be used long-term) to guide learning process in the classroom. The learning model has several components, which are 1) there are steps (Syntax), 2) a social system, namely there are activities carried out by teachers and students, 3) the principle of reaction, there is interaction between teachers and students and it can also be seen from the teacher's response to participants students, 4) support systems, which are the conditions required by a model (technical capabilities and facilities), and 5) instructional impacts and accompaniment impacts (9,10). The FGIL model developed can be said to be a learning model because it fulfills the five components of the model.

From table 1 it can be seen that the results of the validity of the FGIL model on the chemical kinetics material for year 1 students by experts, obtained a value of V = 0.85 in the valid category. This indicates that the model developed is valid in terms of content feasibility, construction feasibility, language and graphic.

In terms of content feasibility, the FGIL Model has an average V of 0.86 in the valid category. That means, the orientation that is conveyed through the video is in accordance with the material being taught, the model (pictures, tables, etc.) used to answer key questions is in accordance with the material being taught, scientifically correct, and can be explored to answer key questions. The key questions contained in the exploration stage (in Edmodo) can lead to explore the models, the combination of models with key questions can guide the students for finding the concepts, and the exercises and questions contained in Edmodo can strengthen and solidify the concepts.

In terms of construction feasibility, the FGIL model has an average V of 0.87 in the valid category. This means that the learning design is based on the guided inquiry learning cycle, the Edmodo application that has been socialized before makes it easier for students to access learning; Orientation videos have image quality and clear sound; the presentation of questions accompanied by models (pictures, tables, etc.) make the students easier at the exploration stage; the key questions given have started from simple to complex; presenting the application stage on Edmodo's small group feature allows students to have discussions between group members; and the closing stage which is carried out directly using theapplication *zoom meeting* allows students to confirm the concepts obtained with the lecturer directly.

In terms of language, the FGIL model has an average V value of 0.85 in the valid category. This means that the language used in the orientation video is valid, and the language used in the key questions is a good and correct language according to Indonesian spelling rules.

From a graphic point of view, the FGIL model obtained a V value of 0.81 in the valid category. This suggests that the models (pictures, tables, etc.) that are presented in Edmodo can be observed clearly.

The FGIL model in the chemical kinetics material developed has a very high category of practicality in terms of student and lecturer assessments. The practicality of the students' responses shows that the average P value obtained is 82 which is in the very high category. As for the practical results of the lecturers' responses, the average P value obtained was 85 in the very high category. From the results obtained, it can be seen that the FGIL model in chemical kinetics material developed is easy to use by students and lecturers, it also can make the learning process more efficient because students can learn at their own learning pace, and can be useful in terms of understanding the concept of material and increasing student activity.

In terms of ease of use, it was obtained an average P value of 82 with a very high practicality category. This indicates that the learning steps based on the FGIL model are easy to understand. In addition, the models (pictures, tables, etc.) and key questions provided on Edmodo are easy to understand. So this also indicates that the language used in Edmodo is easy to understand.

In terms of learning time efficiency, the FGIL model has a very high level of practicality with an average P value of 80. This shows that by using the FGIL model, students can learn at their own pace. thus causing learning time to be more efficient.

In terms of benefits, the FGIL model has a very high level of practicality with an average P value of 84. This indicates that the use of the FGIL model makes it easy for students to understand the concept of chemical kinetics. The models (pictures, tables, etc.) used in Edmodo can help students answer key questions, so that they can help the students understand concepts. In Edmodo, there are exercises and questions that can strengthen the students in understanding the concept of chemical kinetics, and using the FGIL model can increase student interest and activity in learning.

IV. CLOSING

Based on the research that has been done, it can be concluded that:

1. The *Flipped Guided Inquiry based Learning* (FGIL) model on chemical criteria material for year 1 students can be developed.
2. The *Flipped Guided Inquiry based Learning* (FGIL) model on chemical kinerics material for year 1 students developed has a validity value of 0.85 with valid criteria, and a practicality value of 82 with a very high practicality category,

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