Flipped Learning Model - Guided Inquiry Learning (FGIL) for Digital Learning for First Year Chemistry Students

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Abstract: The COVID-19 pandemic that has hit Indonesia has changed the learning process at every level of education including in universities, face-to-face learning that was previously carried out has turned into online learning, this is also what causes digital learning at this time to become a necessity. Flipped Learning Model - Guided Inquiry Learning (FGIL) is one of the learning models that can be applied to digital learning models. The type of research used is the educational design reservoir (EDR) which was developed using the plomp model. The subjects of this study consisted of lecturers from Padang State University and students studying general chemistry. The instrument used consists of a validity questionnaire, a practicality questionnaire. Validity data was obtained using Aiken's V formula and practicality data was obtained using the practicality percentage formula. Based on the research conducted, the media validation and content validity values were obtained respectively, while the practicality values obtained were, these results indicate that the FGIL model is valid and practical to use in the learning process.

Keywords: FGIL; Flipped Classroom; Edmodo; Digital Learning.

Introduction

The continued increase in Covid-19 cases in Indonesia has caused universities to not be able to fully organize PTM. Most universities carry out Distance Learning or what is known as Online Learning. This is a challenge for a teacher or lecturer in using the right learning model, so that student learning achievement does not decrease. Therefore, every lecturer must be able to apply learning models that can increase student learning motivation (Syafitri, 2016).

One of the lessons that can be applied during online learning is Blended Learning. Blended Learning is a learning model that integrates face-to-face learning with online learning (Muawiyah et al., 2018). This learning has four models, one of which is a rotation model. In practice, this model is implemented by rotating learning according to the teacher's policy. The rotation model has four types of sub models including station rotation, lab rotation, flipped classroom, and individual rotation (Marry, 2016).

Flipped Classroom is a learning process with a reverse class concept, where students get an introduction to learning from the lecturer through learning videos or reading material outside the classroom, and in the classroom students face to face discussing solving problems according to the introduction that has been given previously (Nouri, 2016). Based on research conducted on the flipped classroom learning model, it is stated that the learning can increase student involvement and activity, so it is hoped that by applying this learning model, student learning outcomes can also increase (Albar et al., 2021).

Based on previous research, the combination of guided inquiry and flipped classroom showed a maximum increase in student learning outcomes (Syafei & Mawardi, 2022; Aumi & Mawardi, 2021; Mawardi et al., 2020). In contrast to previous research, this development was carried out using the Edmodo LMS which is a website-based LMS that can be accessed easily and free of charge. In addition, in order to maximize the interaction between lecturers and students, zoom meeting media is also used. The use of this zoom meeting can also make it easier for students to repeat learning through the available recording tools.

Method

The type of research used in this research is education development research and Educational Design Research (EDR). EDR is a systematic study of designing, developing, and evaluating educational interventions such as programs, strategies, teaching materials, products, and systems as solutions to problems in education, which also aims at knowledge.

This research was conducted to develop a learning model, namely FGIL (Flipped Classroom based on Guided Inquiry). The development model applied in the research uses the Plomp model design developed by Tjeerd Plomp. This model consists of three stages, namely: (1) preliminary research, (2) the development or prototyping phase, and (3) the assessment phase (Plomp, 2013). In the preliminary stage, identification and analysis are carried out to develop the FGIL learning model. The stages carried out in the preliminary stage in this research consist of needs and context analysis, literature study and finally the development of a framework of thinking.

The prototyping stage is the stage of analysis, design, evaluation, and revision. Then followed by realizing a product in the form of an FGIL learning model for Thermodynamics material. This prototype formation stage is a micro cycle of research with formative evaluation as a very important research activity with the aim of improving and perfecting the resulting product. At this stage, it begins with designing, designing learning using the Flipped-Guided Inquiry model, determining the model in the form of graphs, images, data tables, videos, and others, which are in accordance with the Thermodynamics material that will be taught with the FGIL model, making key questions that are adapted to the concepts being taught. expected and based on the FGIL model, boasting fieldtest questions and practice questions, entering parts of the FGIL syntax on Edmodo the product produced at this stage is called prototype I.

Then a self-evaluation of prototype 1 is carried out using an instrument in the form of a checklist. Which aims to see the completeness of the Guided Inquiry learning component based on Flipped Classroom and to revise and complete the incomplete parts of the Edmodo system, the product produced at this stage is called prototype II.

Then carried out an expert assessment and individual evaluation (One-to-One Evaluation) of the Prototype II. The instrument used at the expert assessment stage is in the form of media validation sheets and content whose assessment component is the display component. Ease, content, presentation, language and graphics. The product produced at this stage is called prototype III. Then carried out a small group evaluation of prototype III. Small group evaluation is carried out to determine the level of practicality of the product developed, by giving an assessment on the small group evaluation practicality sheet.

On the validation sheet, the validator is given a statement and the validator will provide an assessment of the statement. The validator's assessment of each statement was analyzed using Aiken's V formula as Formula 1.

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

Information:
s : r - I_o
r : value given by validator
I_o : lowest validity value
n : number of expert validators
c : highest validity score

Meanwhile, the assessment of the practicality sheet was obtained from the provision of student response questionnaires which were analyzed using the Formula 2.

$$p = \frac{f}{N} \times 100 \tag{2}$$

Information:
p = final value
f = score
N = maximum score

Result and Discussion

From the context analysis and needs analysis conducted at the preliminary stage in this study, the results showed that each lecturer generally used whatsapp group media, e-learning and zoom meetings with lecture, discussion, and assignment learning methods. Based on the literature study that has been carried out, it is very important to develop FGIL to improve student learning outcomes during the online learning process. From this stage it was concluded that the development carried out was very relevant to be carried out at this time, especially for the development of digital learning.

From the self-evaluation process, it was found that the language used for instruction at the closing stage at Edmodo was still not communicative, so the learning model was revised again according to the results of the evaluation carried out. Overall, the results of content validation and media validation based on expert validation can be seen in the following Table 1.

Table 1. Overall Results of Content Validation based on Expert Validation

Rated aspect	Mark	Category
Contents	0.88	Valid
Presentation	0.87	Valid
language	0.86	Valid
Graphics	0.85	Valid
Average	0.86	Valid

Table 2. Overall Results of Media Validation based on Expert Validation

Rated aspect	Mark	Category
Appearance	0.80	Valid
Convenience	0.90	Valid
Average	0.80	Valid

The validator also provides suggestions regarding the development of learning carried out, including suggestions related to improving the editorial writing to comply with the EYD rules, and improving image quality as a model and sound quality in videos in orientation activities.

Based on the practicality tests carried out, the results obtained that the resulting prototype has a very high practicality. As the name indicated by the following table:

Table 3. Results of the practicality tests

Rated aspect	Mark	Category
Ease of Use	82	Very high
Time efficiency	80	Tall
Benefit	81	Very high
Average	81	Very high

The learning model is a conceptual framework that describes regular procedures in the learning process or activity to achieve the learning objectives that have been set (Irvy, 2020). A learning model has characteristics such as based on educational theory and learning theory from certain experts. The FGIL model comes from a blended learning model that is a learning model by combining face-to-face or virtual learning models with online learning (Puspitasari, 2022), besides that this model is also based on Jean Piaget's learning theory which states that the learning process will occur if there are individual activities interacting with the social and physical environment has a specific educational mission or goal. This can be seen from the development objectives carried out, namely to produce an effective learning model in improving student learning outcomes in the online learning process, besides the FGIL model developed is also adapted to the learning objectives that have been set. It can be used as a guide for improving teaching and learning activities in the classroom.

Based on the implementation of the FGIL model for students showing an increase in student learning outcomes, therefore the FGIL model can be used as a model for improving teaching and learning activities. Besides that, a guidebook for implementing the FGIL model is provided, so that lecturers can use it during teaching and learning activities take place can have parts of the model consisting of a sequence of learning steps (Syntax). In the FGIL model there is a syntax consisting of stages of orientation, exploration and concept formation, application and closing. there are reaction principles, this can be seen from the reactions given by the lecturer to students for each stage in the FGIL model such as at the application stage which is carried out by discussing through the small group feature, in the discussion process it is clear that the reaction given by the lecturer to the results obtained discussion.

The existence of a social system, this can be seen from the interactions carried out by lecturers and students and the existence of a support system, seen from the media used such as LMS Edmodo, laptops, internet and others. have an impact as a result of applying the learning model which consists of the impact of learning and the impact of accompaniment, making learning designs according to the selected learning model. Based on the characteristics of the learning model, it can be concluded that the FGIL learning model can also be stated as a learning model, because it fulfills the characteristics of the learning model.

Before being tested a learning model must be included in the valid category, so that it is suitable for use in the learning process, in this study media validation and content validation of the FGIL learning model were carried out by five validators, in media validation the aspects assessed consisted of aspects of appearance and convenience. Meanwhile, in content validation, the aspects assessed consist of content, presentation, linguistic and graphic aspects. Based on table 1 shows that the results of media validation and content validation from expert validation are in the valid category with a value of 0.80 for media validation and 0.86 for content validation. So, it can be concluded that the FGIL learning model developed already has valid aspects of appearance, convenience, content, presentation, language and graphics.

Based on media validation by the validator, the display aspect of the FGIL learning model has an AIken's value of 0.80 which is included in the valid category, this is because Edmodo which is an LMS for the learning process has a clear and well-functioning Edmodo notification display, its features also have easily recognizable symbols, clear use of letters, numbers, and symbols, good visual quality of graphics and images, good video quality presented on Edmodo, as well as sound quality presented on Edmodo which is quite clear and free from noise, arrangement of process stages learning is well organized and neat. So, this will make

students interested in using Edmodo in the learning process.

Meanwhile, for the convenience aspect of the FGIL learning model, the AIken's value of 0.90 is included in the valid category, because the learning guide provided is easy to understand. The Edmodo LMS used can be easily accessed for free. Edmodo is able to backup data automatically, so that students and lecturers do not need to worry about missing data. The Edmodo planner provides reminders regarding the lecture agenda that will be carried out, so that the lecture process becomes effective. Presentation of files into Edmodo can be done easily and without confusion, so that it will make it easier for lecturers and students to upload files to Edmodo according to the features that are clearly available.

The classes feature can be reproduced according to the number of classes or the number of courses taught according to the needs of the lecturer, so that it will be easier for the lecturer to manage his class. the small groups feature is able to group students based on the specified discussion groups, the small group feature can be used in discussion activities properly, the small group feature is used to organize group discussions to be more organized, through the small group feature the interaction between group members can take place optimally, so that the results of the discussion can be maximized. obtained will also be maximized.

Based on content validation from expert validation, the content aspect of the FGIL learning model has an AIken's value of 0.88 and is included in the valid category, this is because the content of the FGIL learning model has learning objectives that are in accordance with learning outcomes (ELO), the material presented is in accordance with the demands of the semester learning plan and scientifically correct, as well as the FGIL learning model used has been adapted to the material being taught.

Meanwhile, the presentation aspect has an AIken's value of 0.86 which is included in the Valid category. This is because the LMS Edmodo used can make it easier for students to participate in learning, orientation videos containing introductory material can build student motivation before studying the material to be studied, the model used is scientifically correct and in accordance with the material being taught, the model used can be explored. to answer key questions, a combination of models and key questions can train students to find concepts, key questions are arranged from simple to complex, exercises contained in Edmodo can strengthen and strengthen student concepts, presentation of application stages on group features (small group) Edmodo can make it easier for students to conduct discussions/interactions between group members, and closing activities carried out using zoom meetings allow

students to reconfirm the concepts obtained with the lecturer directly.

While the linguistic aspect has an AIken's value of 0.86 which is included in the Valid category. This is because linguistically the language used in the orientation is communicative, the language used in giving instructions is clear and easy to understand, the language used in the key questions at Edmodo is in accordance with the EYD, as well as the consistent and precise use of symbols.

Furthermore, in the graphic aspect, AIken's value is 0.85 which is included in the Valid category. This is because graphically the images and models presented can be clearly observed, the submicroscopic representations displayed already describe macroscopic phenomena, and the arrangement of learning activities at Edmodo is well organized.

Practicality test was conducted on a small group of students. The learning model is said to be practical if there is consistency between the typology of expectations and assessments as well as expectations and operations. Aspects assessed in the practicality test consist of ease of use, time efficiency, and benefits. Meanwhile, the lecturer respondents assessed the components consisting of ease of use, time efficiency, and benefits.

Based on the practicality test, the value of 82 is obtained which is included in the very high category. This is because the learning steps in the FGIL model are easy to understand, the material contained in Edmodo is easy to understand and simple, the models (images, tables, graph equations, etc.) contained in Edmodo can be understood well, the key questions used are easy to understand, and the language used in Edmodo is easy to understand.

Conclusion

The Flipped-Guided Inquiry Based Learning (FGIL) learning model based on content validation and media validation by validators is declared valid with an average value of aiken for content validation of 0.86 and media validation of 0.80. In addition, the Flipped – Guided Inquiry based learning (FGIL) learning model based on practicality tests on small groups of students is stated to have very high practicality with a score of 82.

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