

# *Flipped Classroom Learning System Based on Guided Inquiry on Electrolyte Solution and Nonelectrolyte Solutions for Class X SMA/MA Students*

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**Abstract**—The covid-19 pandemic led the Indonesian government to make the decision that learning be conducted online. Online learning requires learning that requires teachers and students to be creative and skilled in carrying out learning. While the 2013 curriculum requires learning to be carried out oriented towards students. Therefore, research is needed that aims to develop an inquisition-based flipped classroom learning system guided by electrolyte solution materials and nonelectrolite solutions that can improve the quality of learning during pandemics and to face the 4.0 era. This research uses plomp research model, with R&D research type, through 3 stages, namely: (1) Preliminary research; (2) Prototyping stage; 3) Assessment phase. This learning system is conducted validation test with Aiken's V formula with validity value which is categorized as very valid, and practicality test with percentage formula with practical category for students and very practical if used by teachers in learning. So the flipped classroom learning system becomes a way out of the problems faced during pandemic learning.

**Keywords**— Flipped classroom; electrolyte solutions and nonelectrolyte solutions; Guided Inquiry

## I. INTRODUCTION

The Covid-19 pandemic has a huge impact on the community both in terms of economy, tourism, social and education. On March 24, 2020 the Republic of Indonesia issued SE Number 4 of 2020 concerning the Implementation of Education Policy in the Emergency Period of the Spread of COVID. In the SE it is explained that learning is carried out from home or so-called online. This online learning students can freely learn that is with the place and time when and where they are. Learning can still be related in ways such as watching converence videos, classroom, live chat and whatsapp group(Wahyu Aji Fatma Dewi, 2020).

Online learning requires learning that requires teachers and students to be creative and skilled using technology. Students must be able to access the app during learning such as using Zoom and other applications. Although this can be done but there are also obstacles in the learning process, such as poor network access, the high cost of data to access an application, parents are not ready to adapt to technology, parents who are less instrumental in accompanying children to study at home, and the lack of interaction between teachers and students and students with other students(Abd. Rahim Mansyur, 2020).

Learning in the online age, one of the learning that can be used is blended learning. Blended Learning is an educational approach to combining face-to-face instruction (F2F) with ICT instruction. In the Covid-19 pandemic the Blended Learning model may be the best solution of New Normal for all education units. Meanwhile, traditional F2F has to be changed by social distancing to

prevent Covid-19. Blended Learning is the right solution to balance all interests in the long run (Kobchai Siripongdee et al, 2020). In blended learning there are two types of learning, namely asynchronous learning and synchronous learning. Synchronous is a defense that the process occurs simultaneously that is at the same time between educators and learners although it does not occur in the same place, while asynchronous learning is different time and place but learners learn the same teaching materials. Blended learning there are four types of models that can be used. One of the four types of models is the rotation model. Rotation model is a learning method where students will experience rotation according to the schedule and policies of the educator. Rotation model has four types of submodels namely station rotation, lab rotation, flipped classroom and individual rotation (Powell et al 2015).

Flipped classroom is one of the models that improves the quality of learning because flipped classroom is student-centered. In the past as we know that learning is done by lecture method which means teacher-oriented learning, meaning that learning is done by lecture method and students listen and do instructions from the teacher. Flipped classroom learning is an alternative learning that is the solution of teacher-centered learning (Ahmad Mubarak, 2017). Flipped classroom is also called an inverted classroom. On this model reverse the approach instructions. Flipped classroom provides the benefit of active learners in learning according to the speed at which they understand the material while learning and they can access the material to their liking. The use of flipped classrooms can improve students' learning quality because students independently learn and can focus on reviewing the theories that students need. Flipped classroom is also more effective in the learning process, flipped classroom is able to improve students' learning outcomes.

The 2013 curriculum says that learning should be designed for student-oriented learning. Learning subjects are placed to students in order to produce good learning outcomes such as cognitive, affective, and psychomotor aspects. Student-centered learning model is one of which is guided inquiry. In the guided inquiry model, the teacher prepares the implementation of guidance and guidance to the students. In this model the teacher determines the aspects of the problem and the stage of its completion. Guided inquiry process of students working to formulate problems, analyze results and make decisions while teachers become facilitators (Asni, Wildan, Hadisaputra, 2020). Guided inquiry model makes students think critically and are able to solve the problems they experience during learning (Aumi & Mawardi, 2021). The guided inquiry model has 5 syntax: Orientation, Exploration and Concept Formation, Application and Closing (Mawardi et al., 2020). According to Aini et al., (2019) that the guided inquiry model is a highly effective learning model that can be used in chemistry subjects, as the guided inquiry model gives students the opportunity to learn and work in groups.

While learning traditionally the implementation of learning is done in a face-to-face manner in class. However, due to the Covid-19 pandemic and the exit of SE Republic of Indonesia Number 4 of 2020 which requires distance learning and social distancing in order to prevent the spread of Covid-19, learning is conducted online. In this online period, the learning model that can be used is guided inquiry, where the guided inquiry model is a learning model that gives students the opportunity to think in order to get the concept independently of various problems and can learn and work together in groups to be helped when doing learning even though it is done online (Danczak et al., 2020) so this model is very helpful online learning today.

## **II. METHOD**

The research conducted is using plomp model with R&D research type which has 3 stages, namely: (1) Preliminary research; (2) Prototyping phase; 3) Assessment phase, Research conducted to produce a product in the form of development of Flipped Classroom learning based on Guided Inquiry on Electrolyte Solution Material and Nonelectrolyte for class X SMA / MA and assess the level of validity and practicality of the learning model. This study has research subjects, namely: (1) Lecturer majoring in Chemistry FMIPA UNP, (2) Teacher of chemistry subjects SMAN 8 Padang and (3) participants didk class X SMAN 8 Padang. Research on the development of flipped classroom learning based on inquisition guided on Electrolyte Solution Material and Nonelectrolyte Solution for class X SMA/MA is at SMAN 8 Padang and the implementation time is in the 2020/2021 school year.

Preliminary research stage there are several analyses that do, namely needs analysis, curriculum analysis, literature study and concept analysis. The analysis needs to be done to find out the problems experienced by students and teachers in the field. Curriculum analysis is done by means of syllabus and curriculum analysis, participants' analysis is done to examine the learning targets of students. After the preliminary research stage was reviewed and determined solutions to face the problem and developed conceptual framework and developed a learning system flipped classroom based on inquisition guided on electrolyte solution material and nonelectrolyte solution.

Prototyping Phase stage, performed with formative evaluation. Formative evaluation is performed in each prototype produced. Prototyping Phase produces prototype 1, prototype 2, prototype 3 which is the result of formative evaluation. Prototype I is to design a learning system on electrolyte solution material and nonelectrolyte solution, after the prototype I is produced then conducted self-evaluation, then prototype II is to make a checklist to see the completeness and make revisions to the incomplete part, after which prototype III is done an expert assessment, after that do one to one on 3 students. After prototype III is completed, a small group of students will be tested. This will result in prototype IV.

Assesment phase is the stage that is done to conclude whether the product is worth using in field practice. Laparangan test is conducted at this stage so that the level of practicality. The final step, conducted analysis of questionnaires filled by teachers and students and make revisions according to the advice of teachers and students so as to produce a final prototype in the form of a manual and development design flipped classroom-based learning guided on electrolyte solution material and nonelectrolyte solution that has been valid and practical

### III. RESULT AND DISCUSSION

This educational development research aims to produce a flipped classroom learning system based on guided inquiry. This research was conducted based on the type of R&D research with Plomp development model. With the following stages: (1) Prototype I was designed with the creation of a Guided Inquisition-Based Flipped Classroom Learning System Development on electrolyte solution and nonelectrolyte solution material. (2) In prototype II, formative evaluation is conducted in the form of self evaluation, by means of a completeness check list system on the model. Then if there are shortcomings in the guided inquiry learning guide and also the page in edmodo then revisions are made so as to produce prototype II. (3) This stage is done to obtain the validation level of the developed learning system, namely by means of evaluation: (a) one to one evaluation; (b) Expert Assessment, this stage which produces prototype III; (4) furthermore, the practicality test after revision to prototype III, after the practicality of students and teachers, the prototype IV is produced.

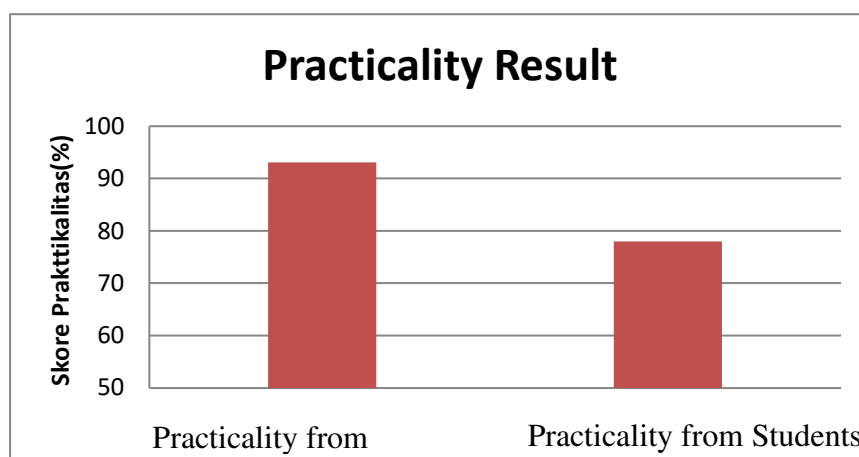


**Picture 1. Cycles Guided Inquiry Model Learning Stages And Flipped (Aumi &Mawardi, 2021)**

The learning system is the unity of several components of learning that are interrelated in achieving the learning objectives that have been set. The learning system has several components including: students, educators, curriculum used, teaching materials that can be used at the time of learning, learning resources, learning processes implemented, facilities that support learning activities, environment and learning objectives. Each part of the learning must be prepared in accordance with the target of the learning carried out (Reigulth, 1999)[13].

Flipped classroom-based guided inquiry is conducted through two sessions, synchronous and asynchronous. In this session, the guided inquiry learning model consists of 5 learning syntax, namely orientation, exploration and formation of concepts, applications, and closings. At the orientation stage, exploration and formation of concepts and applications are done using Edmodo LMS while the cover is done using zoom meeting. First the teacher prepares the materials taught and prepares the students for online learning, the teacher gives the student assignments before entering the class and during the class the teacher discusses the assignments given to the students.

In terms of ease of use obtained an average P value of 78 % with a practical category. This suggests that model-driven learning steps are understandable. In addition, the model and key questions given to edmodo can be understood. Thus this proves that the language used in Edmodo can also be understood. In terms of time efficiency the shopper of this model has a practical rate of 72% with a fairly practical category. This shows that using this learning system can help students in learning according to their own speed, making it more efficient. In terms of benefits, the inquisition-based flipped classroom learning system guided by electrolyte solution materials and electrolyte solutions has a practical category of  $P = 76.67\%$ . This suggests that the use of this learning system students can understand the material of electrolyte solution and nonelectrolite solution. The model given to Edmodo can help students answer key questions, thus guiding students to discover concepts. In Edmodo given exercises and questions that can help students improve their understanding of electrolyte solution material and nonelectrolite solution. The results of practicality data can be seen in the following diagram:



**Picture 2. Practicality Result**

#### **IV. CONCLUSION**

Learning using an inquisition-based flipped classroom learning system can be used by teachers and learners in online learning. From the results obtained, the learning system for electrolyte solution material and nonelectrolite solution can be used because it has been tested validity and practicality

#### **ACKNOWLEDGMENT**

Thank you very much I convey to Mr. Dr. Mawardi, [M.Si](#) who has guided me in this research. Thank you to Mrs. Fitri Amelia, S.Si, M.Si, Ph.D as the head of the Department of Chemistry FMIPA Padang State University. Thank you to Mrs. Dra. Asra, [M.Si](#) as a chemistry teacher who has provided knowledge in this research. Thank you very much to the Chemistry Dapaertemen of Padang State University and thank you very much to the Teachers and Students of SMAN 8 Padang who participated in this research.

#### **REFERENCES**

- [1] Aini, F. Q., Fitriza, Z., Gazali, F., Mawardi, M., & Priscylo, G. (2019). Perkembangan Model Mental Mahasiswa Pada Penggunaan Bahan Ajar Kesetimbangan Kimia berbasis Inkuiri Terbimbing. *Jurnal Eksakta Pendidikan (Jep)*, 3(1),40. <https://doi.org/10.24036/jep/vol-iss1/323>
- [2] Dewi WAF. (2020). Dampak COVID-19 terhadap Implementasi Pembelajaran Daring di Sekolah Dasar. *Edukatif J Ilmu Pendidik*. 2020;2(1):55-61. doi:10.31004/edukatif.v2i1.89

- [3] Mansyur AR.(2020) Dampak COVID-19 Terhadap Dinamika Pembelajaran Di Indonesia. *Educ Learn J.* 2020;1(2):113-123.
- [4] Siripongdee K, Pimdee P, Tuntiwongwanich S.(2020). A blended learning model with IoT-based technology : effectively used when the COVID-19 pandemic ? 2020;8(June):905-917
- [5] Powell, A., Watson, J., Staley, P., Patrick, S., Horn, M., Fetzer, L.,... Watson, J. (2015). Blending Learning: The Evolution of Online and Face-to-face Education from 2008- 2015 Blending Learning : The Evolution of Online and Face-to-face.(July).
- [6] Mubarak A.(2017). MODEL FLIPPED CLASSROOM DALAM MEMOTIVASI BELAJAR SISWA. Published online 2017:184-188.
- [7] Asni, Wildan, Hadisaputra S. (2020). Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Hasil Belajar Kimia Siswa Materi Pokok Hidrokarban Pada Kelas XI PMIPA SMAN 1 Woho Tahun Ajaran 2019/2020. Published 29 Mei 2020. Doi:10.2903/cep.v3i1.1450
- [8] Aumi, V., & Mawardi, M. (2021). Validity And Practicity Of Flipped Guided Inquiry Based Learning (FGIL) Model In Chemical Kinetics For Year 1 Students, 4, 142-147.
- [9] Mawardi, M., Aisyah Fitri Rusiani, J., & Yani, F. H. (2020). Effectiveness of student worksheets based guided inquiry on acid base material to improve students higher order thinking skill (HOTS). *Journal of Physics: Conference Series*, 1481(1). <https://doi.org/10.1088/1742-6596/1481/1/012083>
- [10] Danczak, S. M., Thompson, C. D., & Overton. T. L. (2020). Development and validation of an instrument to measure undergraduate chemistry students' critical thinking skills. *Chemistry Education Research and Practice*, 21(1), 62-18, <https://doi.org/10.1039/c8rp00130h>