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Implementation of Flipped Classroom Model on Distance Learning on Volta Cell Application Topics

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Abstract

This study aims to analyze the implementation of the flipped classroom model in distance learning chemistry in the voltaic cell applications concept. This study used a descriptive method involving 1 teacher and 36 twelfth-grade students. The instrument used was an observation sheet to observe the flipped classroom model's learning process. The results showed that The implementation of the flipped classroom model in chemistry distance learning consists of 3 stages, namely before-class, during-class, and after-class, by combining synchronous and asynchronous activities. Students learn independently through videos with pre-learning questions as guidance in the before-class stage. In the during-class stage, synchronous learning is carried out through zoom meetings to discuss the concept of voltaic cell applications in specific contexts. At the after-class stage, learning is carried out asynchronously by providing a project to design an electrical energy generator that applies to the concept of a voltaic cell. The results showed that the flipped classroom model could be an alternative model for distance learning during the Covid 19 pandemic.

Keywords: distance learning; flipped classroom; voltaic cell

Abstrak

Penelitian ini bertujuan menganalisis implementasi model *flipped classroom* pada pembelajaran kimia jarak jauh untuk materi aplikasi sel volta. Penelitian ini menggunakan metode deskriptif yang melibatkan 1 orang guru dan 36 siswa kelas XII yang mengikuti pembelajaran kimia jarak jauh. Instrumen yang digunakan berupa lembar observasi untuk mengamati keterlaksanaan proses pembelajaran aplikasi sel volta dengan model *flipped classroom*. Hasil penelitian menunjukkan bahwa: 1) Implementasi model *flipped classroom* dalam pembelajaran kimia jarak jauh terdiri dari 3 tahap yaitu tahap *before class, during class,* dan *after class* dengan memadukan aktivitias sinkron dan asinkron. 2) pada tahap *before class,* siswa belajar secara mandiri melalui video pembelajaran dengan pertanyaan pra pembelajaran sebagai penuntun. 3) pada tahap *during class* dilaksanakan pembelajaran secara sinkron melalui *zoom meeting* untuk membahas konsep aplikasi sel volta dengan konteks tertentu. 4) pada tahap *after class*, pembelajaran dilakukan secara asinkron dengan memberikan proyek perancangan alat penghasil energi listrik yang menerapkan konsep aplikasi sel volta. Hasil penelitian menunjukkan bahwa model *flipped classroom* bisa menjadi alternatif model pembelajaran jarak jauh selama masa pandemi Covid 19.

Kata kunci: *flipped classroom;* pembelajaran jarak jauh; sel volta

Introduction

Distance learning during the COVID-19 pandemic is a challenge for teachers to present innovative and varied learning. Diverse and innovative learning is expected to make students not easily bored. Ningsih (2020) states that less variety learning is one of the factors that cause students to get bored easily when distance learning.

Innovations and variations of distance learning can be done by varying the models, methods, and learning media used during the learning process. Pujiasih (2020) stated that to make distance learning quality and fun, and teachers need to pay attention to variations in learning activities, both in the use of learning models and distance learning platforms.

Distance learning with a blended learning system can be an alternative so that learning activities remain varied and of high quality. The study results stated that blended learning has good effectiveness in implementing distance learning and can improve academic results (Setiawan & Aden, 2020) and increase understanding of concepts (Hawi & Sudira, 2019). In addition, blended learning can also increase students' readiness to participate in learning (Firdaus et al., 2020).

The flipped classroom model is a form of blended learning that can be an alternative in implementing distance learning. Baker originally introduced the flipped classroom model in 2000 with the term the classroom flip (Cevikbas & Kaiser, 2020). At first, the concept of this flipped classroom model combined online activities and face-to-face activities in reverse. Material delivery activities were carried out online through media that the teacher and face-to-face activities had prepared were filled with discussion of application material (Fibonacci et al., 2021). In the same year, 2000, Lage, Platt, and Treglia introduced the term inverting the classroom, which essentially has the same concept as classroom flip,

In further development, Hwang & Lai (2017) stated that the flipped classroom is a pedagogical approach that provides students with opportunities to study independently before face-to-face meetings in class. Thus when face-to-face learning, teachers and students interact more to improve learning quality by guiding students to solve learning problems.

Various studies that have been conducted have shown that the use of the flipped classroom model can improve thinking skills and understanding concepts (Cevikbas & Kaiser, 2020; Van Alten et al., 2019; Angelina, P., 2019). In addition, several research results show that the flipped classroom also has an impact on students' non-academic outcomes, such as affecting learning mastery, increasing interest and curiosity (Bariah, 2019), increasing students' learning motivation (Rohmah et al., 2019; Rusnawati, 2020).

The flipped classroom that combines online learning with face-to-face learning in the classroom with a reverse system can increase students' learning motivation (Bariah, 2019, Rohmah et al., 2019; Rusnawati, 2020). In the condition of distance learning during the COVID-19 pandemic, the flipped classroom model scheme needs to be modified by eliminating face-to-face learning activities in class. Therefore, in this study, a modification of the flipped classroom model was developed with a distance learning scheme through synchronous and asynchronous activities while still paying attention to the inverted classroom concept according to the initial concept of the flipped classroom.

Based on this explanation, in this study, the design and implementation of the modified flipped classroom model for chemistry learning on voltaic cell application material is described, which is carried out using a remote system. This voltaic cell application material was chosen because it has characteristics in accordance with the flipped classroom learning setting, namely in activities usually carried out in class, such as the teacher explaining material about the voltaic cell application can be done independently by students at home by watching videos. Meanwhile, for the activities in the class itself on the application of voltaic cells, this can be done by studying

more deeply about product design in accordance with the application of voltaic cells.

Research Method

The research method used in this study is descriptive. This method describes or analyzes research results (Sugiyono, 2010). This method aims to describe the learning activities and activities of students or teachers in detail and depth. The subjects consisted of teachers as implementers of the flipped classroom model implementation and students who took part in learning. The learning activities and activities of students or teachers in this study are more specific on implementing the flipped classroom model in distance learning chemistry on voltaic cell application material.

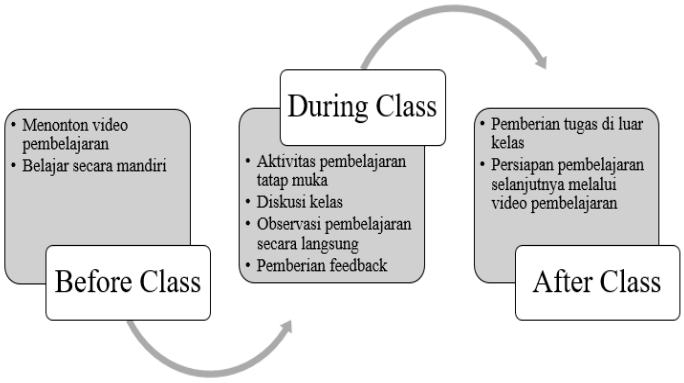
An observation sheet was used as a guide in observing the implementation of the flipped classroom model in learning the application of voltaic cells. The data obtained in this study were analyzed and described qualitatively in a detailed description of the modification and implementation of the flipped classroom model in distance learning.

Results and Discussion

The development of the flipped classroom model design in distance learning is based on the concept of the classroom flip and inverting classroom, which is the origin of the flipped classroom concept. Referring to the initial concept of the flipped classroom proposed by Barke, Lage, Platt, and Treglia, it is known that this model emphasizes the exchange of activities that are usually carried out in the classroom into activities outside the classroom (Hwang & Lai, 2017; Angelina, 2019; Cevikbas & Kaiser, 2020).

Based on the concept of the flipped classroom model that has developed, it is obtained an overview of the design of the learning stages as follows:

Figure 1
Flipped Classroom Model (Abdullah et al., 2019)



In Figure 1 it can be seen that the model *flipped classroom* consists of 3 stages, namely activities before class, during class, and after class. The before the class stage is generally filled with independent learning activities carried out by students, such as watching learning videos given by the teacher according to the material being studied (Bishop & Verleger, 2013; Abdullah et al., 2019; Van Alten et al., 2019). At this stage, students listen to the material presented by the teacher through learning videos. Student activities in listening to material usually done face-to-face in the classroom are transferred to activities outside the classroom, independent learning. Activities can also be filled at the tertiary level by providing teaching materials via the web as reading material about the material being studied (Rohmah et al., 2019).

D*uring class,* Face-to-face learning activities are carried out in the classroom, which is a means of direct interaction between teachers and students. Activities at

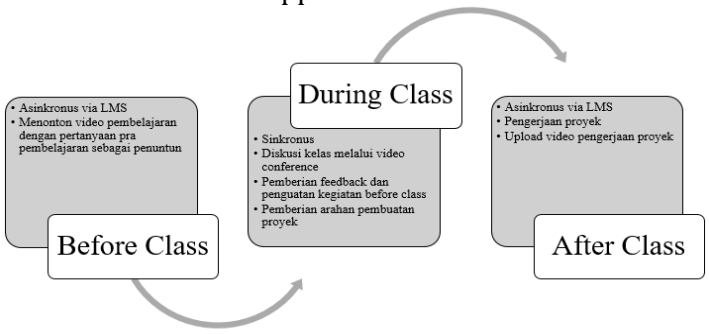
this stage include class discussions regarding applying concepts, providing feedback, and direct observation of student learning progress (Abdullahet al., 2019). Moreover, Hwang & Lai (2017) emphasize that the teacher can help students solve problems and difficulties of learning materials that cannot be solved independently. Thus, the orientation of learning activities carried out by teachers and students must be higher and more complex than before the class stage.

Stage *after class is* carried out outside the classroom with various activities, including independent assignments and forum discussions (Wang et al., 2019), learning surveys, and online group discussions (French et al., 2018). In addition, after-class activities are also filled with giving projects that produce products from the material being studied (Andrini et al., 2018).

Model *flipped classroom* is described as a model design implemented with learning outside the classroom and face-to-face learning in the classroom. During the COVID-19 pandemic, learning is conducted remotely through an online system utilizing various digital learning platforms. Thus the flipped classroom model with a combination of online learning and face-to-face learning needs to be modified by adjusting the distance learning system. All activities use an online system.

Model development and modification *flipped classrooms* in distance learning during the COVID-19 pandemic consist of a combination of asynchronous and synchronous learning. The following is an illustration of the modified design of the flipped classroom model for distance learning:

Figure 2
Modification of The Flipped Classroom Model in Distance Learning



In Figure 2, it can be seen that the modification of the model design *flipped classroom* In distance learning, there is a combination of asynchronous systems via LMS and synchronous systems via video conferencing. In addition to asynchronous and synchronous combinations, modifications are also found in activities during class which in the previous model were carried out face-to-face. In distance learning, this was carried out synchronously through zoom meetings. The description and explanation of the implementation of the flipped classroom model in distance chemistry learning for voltaic cell application material consist of three stages, according to Figure 2.

B*efore class*, the teacher gives a learning video about the voltaic cell application, uploaded to google classroom. To direct students' activities at this stage, the teacher provides pre-learning questions about the application of voltaic cells. Asking pre-study questions can increase students' understanding of the content of chemistry lesson topics studied independently (Sopandi et al, 2014). The questions asked at this stage consisted of questions that emphasized the cognitive levels of C1 (remembering) and C2 (understanding). It is based on the opinion of Ahmed (2016), which states that in before-class activities, students are directed to master the subject

matter at a lower level which will increase in level during class and after class stages.

The teacher asks students to submit answers to pre-learning questions through google classroom to ensure all students participate at this stage. Data obtained from google classroom shows that 94% of students send answers to pre-learning questions before the implementation of during the class stage. It indicates that students generally participate in learning independently by watching learning videos. This result aligns with Sopandi et al. (2014), which found that pre-learning questions made students have more positive learning preparation habits.

D*uring class,* teachers and students connect in sync using zoom meetings. Learning at this stage is initiated by the teacher by discussing the material studied independently by the students. The teacher gives questions directly to several students to ensure the answers that have been sent to Google Classroom. Next, the teacher invites the students to engage in discussions in a virtual class to discuss the voltaic cell application material. At this stage, the discussions carried out by teachers and students are at a higher level of Bloom's taxonomy than the previous stage.

At this stage, discussions, and discussions are directed at the C3 (Applying) and C4 (Analyzing) levels. The teacher's presence directly at this stage can help students develop higher thinking skills (Ahmed, 2016). One of the themes of discussion and discussion raised at this stage includes the electric tree associated with the application of voltaic cells. The theme requires thinking skills from students who do not just memorize and understand voltaic cells but also students need to have the ability to analyze the relationship between electric trees and voltaic cells.

Furthermore, the presence of teachers can also monitor student learning progress and help students who have difficulty in learning concepts (Hwang & Lai, 2017). In its implementation, teachers can directly monitor the development of students' thinking skills, especially in understanding the concept of a voltaic cell, its application, and connecting it to the theme of the electric tree. On the other hand, some students have difficulty understanding the relationship between the concept of the voltaic cell and the electric tree. However, the teacher can immediately assist in the form of directions gradually to find solutions independently.

At the end of learning, the teacher challenges the students to design and make tools that can produce electrical energy. The tools' design must be based on the concept of voltaic cells and use materials that are easily found in everyday life. In addition, the teacher also provides an overview of the assessment and the assessment criteria. The project work is carried out outside the classroom asynchronously at the after-class stage. The teacher still opens a question and answer forum through google classroom to ensure the project's progress.

The after-class stage is an activity that is carried out asynchronously. Students work on design projects and manufacture tools that can produce electrical energy in their groups. The activities of designing and working on this project have a higher cognitive level than before and during class stages. Andrini et al. (2018) stated that the flipped classroom model helps students achieve higher levels of bloom taxonomy through project assignments.

When working on the project design and manufacture of tools that can produce electrical energy, the work activities of the students are recorded, and the results are uploaded via the youtube channel. The teacher assesses by listening to videos that students have uploaded by paying attention to several assessment criteria, including the functionality of the tools, the materials used, and conformity to the concept. The following is an example of a video uploaded to a youtube channel.

Figure 3
Example of Student Project Results Uploaded on Youtube Channel

Conclusion

In distance learning during the COVID-19 pandemic, the flipped classroom model needs to be modified to suit learning conditions that do not involve face-to-face activities. The implementation of the flipped classroom model in distance learning chemistry is a combination of synchronous and asynchronous activities, consisting of three stages. The before the class stage is carried out asynchronously by providing learning videos to be studied independently students with pre-learning questions as a guide. Then during the class stage is carried out synchronously by using a zoom meeting to discuss the voltaic cell application material directly. The after-class stage is carried out asynchronously by giving project assignments to design and manufacture tools that can produce electrical energy by considering the concept of voltaic cells.

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