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Integration of Various Digital Media with Flipped Classroom Models in Chemistry Learning: An Analysis of Student Activities

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ABSTRACT

This study aims to analyze student activity in flipped learning environments and their response to chemistry learning. The variations of digital media used in this research are YouTube, Miro, Wizer.me, Quizizz, Google Form, and Google Classroom. Participants are 11th grade public high school in Depok city, West Java, Indonesia. The method used is a descriptive qualitative method with data collection techniques through observation sheets, teacher diaries, interviews, reflective journals, and student activity questionnaires. The activity questionnaire in this study used StRIP, adapted from DeMonbrun, et al. Activity indicators consist of two dimensions: student response to instruction and instruction type dimensions. Student activity data is processed using a Likert scale. The results showed that the majority of students responded positively to the second dimension. The results showed that students' responses to instructions and types of instructions developed well during the learning process. This is consistent with the results of the student questionnaire data, which shows a percentage of >70% in each dimension. The affective domain shows that some students have a good attitude of responsibility and discipline. They actively express their opinions and work together in groups. In the psychomotor domain, the students show that they are careful in carrying out and compiling the practicum reports. This study concludes that the flipped classroom learning model using various digital learning media can help develop students' activities in chemistry learning.

INTRODUCTION

Indonesians' national curriculum is designed as a development of the existing curriculum. In implementing the national curriculum students are prepared to have relevant competencies to face the challenges of the 21st century, namely the ability to communicate, use technology, think clearly and critically, and the ability to solve problems by considering the moral aspect (Suhesti, 2019; Kemendikbud, 2016). The national curriculum learning process is held in an interactive, inspiring manner, motivating students to participate actively and developing creativity according to experience, challenging, fun, and improving learning outcomes (Suhesti, 2019).

In the national curriculum, a learning model based on Information and Communication Technology (ICT) is developed. The use of technology by teachers can encourage students to be active in learning so that activities that occur during the learning process can run well and meaningfully. There are several digital media that can be used in learning, namely *WhatsApp*, *Google Classroom*, *Google Forms*, *Quizizz*, *Miro*, *Padlet*, *YouTube*, and *Microsoft OneNote*.

However, the application is not optimal, this is because online learning is limited to providing remote assignments with no feedback or interaction between teachers and students. In addition, based on observations and interviews with chemistry teachers at one of the public

high schools in West Java, learning often uses the lecture method and practice questions. There are some media used in online learning are Google Classroom, Google Meet, and Quizizz. The low interest and awareness of students in the learning process cause low student activity.

In addition, due to the pandemic, the results of studying chemistry teachers at one of the public high schools in West Java have decreased. This can be seen in the majority of students' learning outcomes in chemistry learning obtaining learning outcomes in the cognitive domain below 40%, and overall affective and psychomotor learning outcomes are not satisfactory. This can be seen from the low response and attention given by students to the instructions given by the teacher.

Online learning gives flexibility to students to manage their own study time. Based on research by Apriansyah, Sambowo, & Maulana, it was stated that 53% of students liked *WhatsApp* media and *Google Classroom* as online learning media (Sabani, 2021). The student center learning process can run more optimally by applying a learning model that is appropriate to the learning conditions.

The teacher as a facilitator can manage learning by applying learning models that can provide opportunities and encourage students to be more active in practicing communication skills and independent learning. The flipped classroom learning model is an innovative pedagogical approach model that focuses on learner-centered teaching. This is in line with several previous studies which implemented the flipped classroom learning model using instructional media which showed positive research results, such as that it was easier for students to understand the material being studied and obtained increased learning outcomes (Paristiowati, et al., 2017; Kusmaningsih, 2020; Murafer, et al., 2021; Permatasari, 2021). According to Bariroh & Setiawan (2021), the flipped classroom learning model can help teachers increase activity in teaching and learning activities and evaluate learning at the end of the teaching and learning process (Bariroh & Setiawan, 2021).

The use of technology as a digital learning medium can be integrated into the flipped classroom learning model. The purpose of using digital learning media is to reduce student boredom in learning, provide experience to students because learning is carried out not monotonous, and foster student curiosity so that learning activities can go in two directions, so as to improve student learning outcomes. Active learning can foster the willingness of students to learn independently. Awareness for learning can be seen from the amount of initiative and responsibility of students in the learning process, for example being responsible for the tasks given and being actively involved in learning activities. This has an impact on student learning outcomes.

Based on the background described above, the researcher wanted to explore the activities of 11^{th}-grade students in chemistry learning through the application of the flipped classroom model using a variety of digital learning media in one public high school in West Java, Indonesia.

METHOD

Research Design

The research method used is a qualitative research method using observation sheet instruments, teacher diaries, interviews, reflective journals, and student activity questionnaires. According to Miles & Huberman (1994), qualitative data analysis includes three stages, namely data reduction, data presentation, drawing conclusions, and verification (Miles & Huberman, 1994).

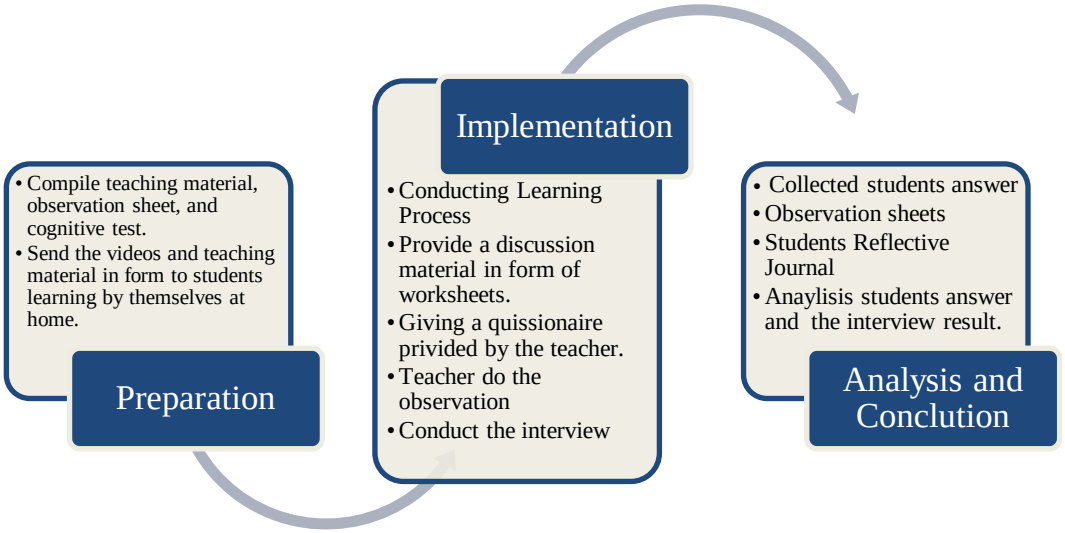

Figure 1. Research Design of Flipped Classroom Learning Process

Research Target

This research was conducted in the even semester of the 2021/2022 school year. The subjects of this study were 30 students in an 11th-grade class in SMA 1 Depok, West Java, Indonesia.

Table 1. Distribution of Students by Gender

Gender	n	%
Female	17	56.6
Male	13	43,4
Total	30	

This research was conducted in three meetings of chemistry learning consisting of two face-to-face meetings and one evaluation test. As long as the flipped classroom learning model uses a variety of digital learning media is applied, it is hoped that the two dimensions of student activity can develop properly including the dimensions of student response to instructions and types of instructions.

Research Data

The study utilized primary data obtained directly from questionnaires , observation, interviews and reflective journal.

Research Instrument

a. Student activity questionnaire

The questionnaire used in this study is a learner activity instrument adapted from the StRIP (Student Instrument) by DeMonbrun et al (2017). The research questionnaire used 41 statements which were grouped into 18 statement items of the dimension of learners' response to instructions and 23 statement items of the dimension of types of instructions. The statements consisted of positive statements and negative statements. Learners' responses were obtained using a Likert scale with four alternative answers, namely Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

b. Observation sheets

Observations were conducted by researchers and observers who helped researchers to observe the teaching and learning process in the classroom using digital learning media.

c. Interviews

This research used semi-structured interviews. Semi-structured interviews were conducted by researchers with students to find out the condition of students' activities in the teaching and learning process of salt hydrolysis material by implementing a flipped classroom using a variety of digital learning media.

d. Reflective Journal

At the end of each session, reflective learner journals are distributed. The learner writes down what they experienced during the teaching and learning activities conducted by the teacher.

Data Analysis

While the trustworthiness wet test is a qualitative research criterion that is the same as being valid, reliable, and objective. In this test, the credibility test is used (Guba, E.G., & Lincoln, 1988). There are four credibility testing techniques, namely prolonged engagement, persistent observation, progressive subjectivity, and member checking.

RESULTS AND DISCUSSION

Implementation of the Flipped Classroom Using a Variety of Digital Learning Media

Researchers conducted 3 research meetings. In research, researchers have two roles, namely as a teacher who has a role to replace the teacher in teaching in each learning activity, and as a researcher, the teacher makes observations of research subjects in each meeting. During the research, the researcher was assisted by two observers who followed and observed the ongoing learning process.

a. Activity Stage Before Class

Before face-to-face learning is carried out, the researcher prepares teaching materials for students studying at home in the form of learning videos that can be accessed via YouTube provided on Google Classroom the day before learning begins. Providing learning videos aims to provide constructive encouragement when students study in class. In addition, by being given learning videos before learning activities in class, students have an overview of the material that will be studied in class. So that students are no longer guessing and feel afraid of the activities that occur in chemistry learning activities. The use of the YouTube platform aims to make students easy to access their heart's content, either via computers, laptops, or mobile phones.

> *"Just be more excited ma'am, because before that I was given a material learning video before, so I know what the material is all about, and what I want to learn so I don't get really confused during class time, so I'm more excited."*
>
> ***(Interview with Student 38, April 20, 2022)***

The researcher gave assignments to students to take quizzes about the material in the video. Quizzes can be filled in by students via Quizizz. The purpose of giving quizzes is so that researchers can ensure students have understood or not the videos uploaded on Google Classroom and YouTube.

The implementation of the previous stage in this class is in accordance with previous research that this stage is an asynchronous stage. At this stage, students access learning material through reading materials and learning videos studying the material, as well as taking online quizzes to find out students understanding of the material to be studied (Heinerichs et al., 2016).

b. Activity Stage While in Class

In the core activity, the researcher involved students in the learning process by dividing students into 7 groups. Each group consists of 5 to 6 students.

Figure 2. The researcher opens the lesson

Each group is instructed to access the students' worksheet in Miro with a link sent via Google Classroom. The students' worksheet contains questions that are used as material for discussion. While the students were having discussions, the researcher monitored and visited each group to ask whether there were any obstacles encountered while working on group assignments.

Each group cooperates in different ways. Implementation of the discussion looks quite active, with the formation of two-way communication. The use of technology in the flipped classroom can encourage collaboration between students because there are group assignments (Evseeva & Solozhenko, 2015). After the discussion, at the first meeting each group submitted answers to Miro, while at the second meeting, each student submitted the discussion results to Wizer.me. After collecting the results of the discussion, group representatives presented the results of the discussion by writing down the answers in front of the class. In the first lesson, there were representatives from groups 3 and 4. Finally, students were asked to conclude learning and fill in reflective journals to evaluate learning.

Figure 3 Group representatives write down the results of the discussion

At the last meeting, a test was carried out to see the level of understanding of students in learning chemistry and its relationship with student activities. The test is given via a link connected to the *Google Forms* application. During the learning process using digital learning media students look quite enthusiastic. This is because the 11th-grade students are new user of the Miro and Wizer.me applications, so the students are quite excited. This is in accordance with the results of Memic-Physic & Bijedic's research (2017) which revealed that students showed a positive attitude towards the design and structure of innovative teaching materials provided electronically (Memic-Fisic & Bijedic, 2017). The use of a variety of digital learning

media makes students enjoy learning activities more. In reflective journals, the majority of students said that during the discussion activities they did not feel bored. This was reinforced by the results of student interviews:

"You provide new media, like Miro, which I just found out about, it turns out that it can be decorated too. So, it's not too burdensome with the material, but there is also entertainment from the media."

(Interview with Student 28, April 23, 2022)

The implementation of the activity phase in this class is in accordance with several previous studies that during class cooperative learning occurs, group discussions, and discuss new concepts synchronously (Cormier & Voisard, 2017; Azwar et al., 2018).

c. After-class activity stage

The last stage, namely the after-class activity stage. In this study, the implementation of the after-class stage was carried out by conveying information about the next meeting directly. At the first meeting at this stage, the researcher did not give assignments. Meanwhile, at the second meeting the researcher gave the task of carrying out a simple chemistry learning practicum curious in himself about the theory learned in class. The implementation of the after-class activity stage is in accordance with some previous research that at the after-class stage students repeat what they have learned during the activity stage during class (Azwar et al., 2018).

Based on the explanation of the three stages of activity in the *flipped classroom* using a variety of digital learning media and the results of the student activity questionnaire described in the next sub-chapter, most students actively participate in activities in each lesson. This is in line with several studies which state that students enjoy and are satisfied with learning using the *flipped classroom* (Lage et al., 2000; Usmadi & Ergusni, 2019). Following are the results of interviews with several students:

"Satisfied, ma'am, in terms of the models, methods and methods that you use."

(Student Interview 9, April 20, 2022)

Student Activities

The student activities that will be analyzed are student activities that appear during chemistry learning with the *flipped classroom* using a variety of digital learning media. In analyzing the activities of students, some data were used from observation sheets, reflective student journals, questionnaires, and interviews. The student activity questionnaire was adapted from the *StRIP Student Instrument* by DeMonbrun et al (2017) which is divided into 2 dimensions, namely student responses to instructions and types of instructions (DeMonbrun et al., 2017).

Calculation of student activity questionnaire data using a Likert, then converted in the form of a percentage. Each statement has options from strongly disagree, disagree, agree, and strongly agree. Student interviews were conducted to obtain in-depth information on student activities in chemistry learning after implementing *flipped classroom* with a variety of digital learning media.

a. Analysis of Student Activity on the Dimension of Student Response to Instructions

On the dimension of student response, the observed aspect is the activity of students after being given instructions by the researcher in chemistry learning activities. In this dimension, student activity is not only raised but needs to be maintained during learning activities. The teacher must pay attention to the interest of students in learning activities. The dimensions of student responses to instructions consist of 11 positive statements and 7 negative statements.

The results of the questionnaire dimensions of students' responses to instructions are depicted in the histogram of the distribution of students' answers as follows:

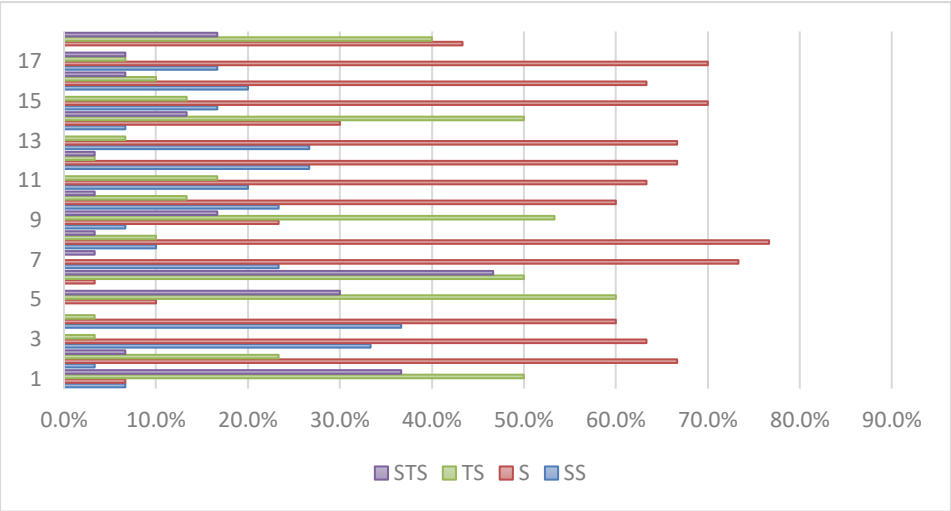

Figure 4. Histogram of the dimensions of student response to instruction

Based on statements 3 and 10 regarding positive views of teachers, it is known that almost all students have positive views about teaching researchers so that they can build a positive atmosphere when learning activities take place so that learning can be more relaxed and students can more easily understand learning chemistry. This is in line with McLaughlin's research (2016) that teachers have improved students' abilities to use learning strategies by applying the flipped classroom (McLaughlin et al., 2016).

"I'm happy because the material is easy to understand and the way of teaching is also relaxed."

(Reflective Student Journal 5, 11 March 2022)

This research is generally carried out by utilizing digital learning media, such as YouTube, Miro, and Wizer.me, Quizizz, and Google Classroom. By using Google Classroom, it will be simpler for teachers to keep track of their student's academic progress and for students to access links for each platform used for learning and assignment collection. At the activity stage when in class students are asked to hold discussions in groups completing practice questions in the online students' worksheet, students are better prepared to take part in discussion activities and are active during learning. Several studies have shown that implementing a flipped classroom can increase student activity in class (Eichler & Peeples, 2016; Lewis et al., 2018; Olakanmi, 2017). This is consistent with the data on the observation sheet.

"Students actively discuss and ask questions about the questions on their worksheets to the teacher..."

(Observation Sheet, March 11, 2022)

The use of digital learning media, such as the Miro and Wizer.me can entertain and increase student creativity. The Miro application is a virtual whiteboard tool that makes it easier for users to collaborate or discuss. The existence of features in Miro makes it easier for teachers to invite students to express their understanding during the teaching and learning process. Meanwhile, Wizer.me is an online students' worksheet with an attractive theme and has complete features for making online assignments. This is what makes some students feel interested in carrying out learning activities when learning chemistry.

"The lessons are really fun, my friends also feel better because there are more discussions, and there is already an idea of what we want to learn, so we don't

worry about whether we will be called upon or not."

(Interview with Student 28, 23 April 2022)

A pleasant learning atmosphere makes students happy and enjoys activities in every learning process. This avoids students' assumptions that learning chemistry is difficult, boring, not fun, scary, and has lots of calculation problems. The use of a variety of digital learning media is also useful for providing a new, more enjoyable atmosphere for students. A pleasant atmosphere can increase the focus and attention of students which is very useful in learning (Hidi, 1995; McDaniel et al., 2000).

In addition to contributing to learning activities, participants can develop laboratory skills through simple chemistry learning practicums. As much as 83.3% of students agreed that students felt they could develop their skills with simple practicums that were carried out individually and independently. Students feel the effort required in carrying out activities and the time used is beneficial. This is in accordance with the statement in point 7 which obtained a percentage of 96.6% of students agreeing, as well as the statement in point 12 with the results of 93.4% of students agreeing. This is in accordance with the following reflective journal data:

"The use of digital learning media is useful in developing student involvement in learning activities."

(Researcher's Observation Sheet, March 18, 2022)

Students' curiosity can arise as a result of students' enthusiasm that is built in learning. Curiosity that grows towards digital learning media makes students learn chemistry learning more deeply. This is in line with the explanation that the desire to know refers to when individuals are involved in learning activities that are created from the pleasure and satisfaction obtained from seeking understanding of something that was previously unknown (Deci, 1975).

The use of digital learning media, such as *Mentimeter*, *YouTube*, *Miro*, *Wizer.me*, *Quizizz*, and *Google Classroom* is something new for students and attracts students' attention, so that student activities develop more both in groups and individually. During the learning activities, students were seen to be very active in conducting discussions and helping each other in terms of understanding the material. The results of Evseeva & Solozhenko's research showed that 85% of respondents liked the combination of technology in the learning process with the flipped classroom (Evseeva & Solozhenko, 2015).

b. Analysis of Student Activities on the Dimensions of Types of Instructions

On the dimensions of types of instructions, the aspects observed are the types of instructions given by researchers in chemistry learning activities. The type of instruction dimension consists of 20 positive statements and 3 negative statements. The results of the questionnaire dimensions of the types of instructions are depicted in the histogram of the distribution of student answers as follows:

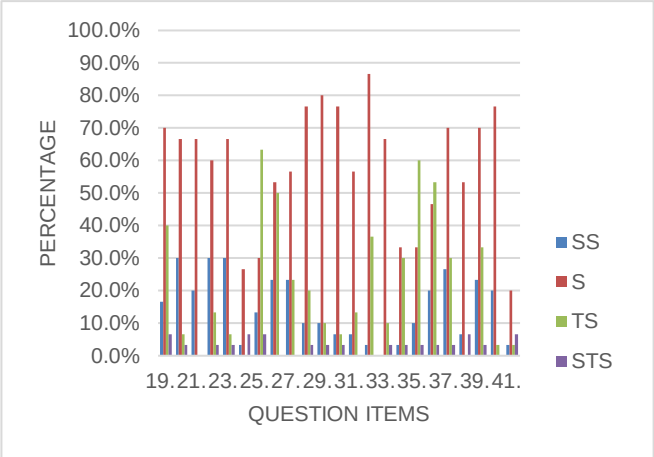

Figure 5. Histogram of the dimensions of the instruction type questionnaire results

One of the activities carried out during learning is discussion. Statements on points 20, 21 and 36 which have similar meanings, namely regarding finding solutions in solving problems show positive results with each statement obtaining a percentage above 65%. This is in accordance with the data in the student's reflective journal.

> *"Of course I like it and have contributed to it. In my opinion, by working in groups we can share things that are not yet known and that are already known so that we can have the same understanding and can explore more in the future. Not only that, we also have to contribute to the work groups so that group work feels light"*
>
> ***(Reflective Student Journal 9, March 11, 2022)***

During the discussion activities students made different contributions to solving questions in students' worksheet. Based on the data below, it can be seen that each student has a different way of solving problems, including solving questions on the students' worksheet given by the researcher. This is in line with previous research studies that each student has a different learning style, so it is necessary to decide how students can learn well (Borg & Shapiro, 1996).

Students stated that the researcher provided sufficient information to complete the practice questions, almost entirely with the statement at point 29 showing 90.0% of students agreed that the information provided by the researcher during learning using digital learning media was quite complete.

> *"Very helpful, I can keep repeating it if I still feel there is something I don't understand."*
>
> ***(Reflective Student Journal 1, March 11, 2022)***

Based on the explanation of the data above, it can be seen that the learning videos used help students understand material before learning in class. Students can repeat the video if there is material that has not been understood. This is in line with Kathleen Fulton's research which states that students can have the opportunity to repeat material if needed as one of the advantages of the flipped classroom (Yildrim, F. S., & Kiray, 2016).

As explained in the previous subsection, students carry out simple practicums individually. A simple practicum is carried out to answer students' curiosity about the theory they have learned. At point 40 it shows that almost all students with a percentage of 96.7% of students agree with the topic of learning chemistry related to the theory being studied. The following is the result of student 16's interview:

> "*There is a connection, when the material was explained and when I did the practicum I understood the material better, what I saw directly indirectly made me understand the material better, not just theory."*

(Interview with Student 16, April 23, 2022)

Based on the explanation of the data above, overall students responded positively to the types of instructions given in chemistry learning. Providing learning videos on one day before learning activities in class makes students feel excited and already have an overview regarding the material that will be studied in class. In addition, during discussion activities students already have the initial knowledge to solve questions in students' worksheet. Every instruction given by the researcher can be well received by the students. It can be seen when learning activities are running conductively, and students are free to ask questions, respond and give opinions regarding the material being studied. Therefore, this type of instruction in implementing the flipped classroom using a variety of digital learning media can be well received by students.

Learning Outcomes

a. Learning Outcomes in the Cognitive Domain

At the last meeting a test was conducted to see the level of understanding of students in learning chemistry and its relationship with students' attitudes. This test uses 20 multiple choice questions that have been tested for the validity of language suitability and GPA. There are 20 of these questions regarding the concept of learning chemistry, calculating pH and applying chemical learning. The test is given via a link connected to the *Google form*. The following is a diagram of the results of the final chemistry learning test.

Based on the test results in the cognitive domain of chemistry learning, the average test results were above the Minimum Completeness Criteria that had been set by the school. The average student test result was 71. The test results showed various scores, there were some students who scored high, but there were also some students who were quite low. Students feel that after learning chemistry material it is not too difficult, but not too easy either. Based on the results of interviews with students 8 and 16 it is known that hydrolysis material is not too difficult.

Students understand the concept of learning chemistry, but there are difficulties in understanding the calculation sub-chapter. The following is the result of the interviews with students 16 and 8:

"..so in my opinion it's not too difficult, the difficulty is sometimes being confused about the variety of questions, only a few variations that I can, sometimes there are questions that are misleading, like during a test."

(Interview with Student 9, April 20, 2022)

Students who obtained quite low learning outcomes, because they found it difficult to understand chemical reactions and various questions in calculating the pH of a salt solution. Based on the results of interviews with students 38 and 8 it is known that due to a lack of understanding of the material prior to learning chemistry, it is quite difficult for students to understand variations in calculation questions. Students who have difficulty with the previous concept will affect the discussion of other concepts because the material is continuous and related to each other (Paristiowati et al., 2019). Table 1 shows a comparison of the results of the average test scores and the overall scores of students regarding students' responses to instructions.

Table 1. The average test results and the results of the questionnaire dimensions of student responses to instructions

Average test scores	The results of the questionnaire on the dimensions of student responses to instructions
71	67,5%

Based on the comparison of the results in Table 1, students feel that they have carried out learning activities well and are serious about learning. Student activities carried out are in line with the learning outcomes obtained. Most students believe in obtaining learning outcomes with a percentage of 60-70%. This is in line with the results of the following interviews and reflective journals:

"I'm sure, because I also pay attention when explaining the material, maybe there's a little that I don't understand, but let it be a trigger for me to study hard"
(Reflective Student Journal 4, 18 March 2022)

Based on the explanation above, the average learning outcomes in the cognitive domain are above the Minimum Completeness Criteria, there are some students who also get increased learning outcomes. This is supported by data from an interview with one of the students, namely student 38 who found it easier to learn chemistry with the flipped classroom using a variety of digital learning media.

b. Learning Outcomes in the Affective Domain

Students' learning outcome in the affective domain, researchers observe students in terms of responsibility, discipline, expressing opinions and working in groups. Responsibility and discipline are seen based on the activities carried out during learning activities, such as students participating actively in learning activities, utilizing teaching materials that must be studied, and working on and collecting assignments given by researchers. In 1th-grade class, almost all students have a sense of responsibility for the tasks and obligations that should be carried out. This is in line with the following research observation sheet:

"Almost all students carry out activities according to instructions given by researchers"
(Researcher Observation Sheet, March 18, 2022)

Based on the researcher's observation sheet, it can be seen that almost all students have a sense of responsibility as students, following every learning activity and trying to find solutions with researchers if they experience problems in working on and collecting assignments. This shows that the implementation of the flipped classroom can make students more personally responsible (Bursa & Cengelci Kose, 2020; O'Flaherty & Phillips, 2015).

Based on the effective learning outcome assessment rubric, for the discipline of XI MIPA 2 students as a whole, it is quite good. This can be seen from the students who actively participate in learning activities and the number of students who take quizzes, and collect the results of discussions and practicum reports according to the allotted time. This is supported by some of the data below:

"For the quiz itself, there were around 27 students who were on time."
(Observation Sheet, March 11, 2022)

"After learning in class, all groups collect the results of discussions according to the allotted time"
(Researcher Observation Sheet, March 11, 2022)

Other effective learning outcomes reviewed are expressing opinions and working in groups. Most of the 11th-grade students have the ability to express opinions and cooperate quite well. This can be seen when the researcher approached each group. Students often respond and ask several questions. In addition, students dare to add and make sure if there is material that is incomplete.

One of the activities carried out during learning is discussion, namely working in groups. Discussion of discussion activities has been explained in the previous sub-chapter. Based on

observations during learning, almost all students are active in group work. Students help each other to solve problems in students' worksheets. Students who already understand quickly help explain to their group mates.

"Student 9 helps explain to their respective group mates during class discussions"
(Researcher's Observation Sheet, March 11, 2022)

If there are students who don't join their groups, other members still make sure whether the students have problems and material which is not understood or not. Based on the explanation above, almost all students have pretty good affective learning outcomes, by having a sense of responsibility, often expressing opinions and actively collaborating in groups. Likewise, the discipline of students regarding the assignment of some students is quite good, but for some students it is necessary to improve.

c. Learning Outcomes in the Psychomotor Domain

Learning outcomes in the psychomotor domain, the researcher reviewed from students' practicum reports in the form of simple practicum videos. Assessment of the practicum report includes: being careful in using tools and materials, carrying out practicum steps, conformity of observations, and making practicum reports. The suitability of the practicum results can be seen from the determination of the nature of the salt solution, which can be seen from the color change which tends towards acidic or neutral. Natural indicators used by students, namely most of the dragon fruit extract and some using turmeric. Dragon fruit extract can be used as a natural indicator which has a pH range of 7.33-9.33 with a color change from pink to green (Meganingtyas & Alauhdin, 2021). Apart from dragon fruit extract, turmeric can also be used as a natural indicator which has a pH range of 9-10 with a yellow-red-brown color change (Safitri, 2013).

Almost all of the students listened to the researcher's instructions regarding the provisions in carrying out simple experiments and preparing reports. Students do a simple practicum at home and a practicum report is made in the form of a video. By making a practicum video for each student, the researcher can assess the skills of students. Based on the practicum reports collected, it can be seen that the skills of students in carrying out each practicum step and making practicum reports. Almost all students are skilled in doing practicum. There are students who are very thorough in using practicum tools and materials, as well as in carrying out each step and observing the practicum results. This is in accordance with the data on the observation sheet observed by the following observers and researchers:

"Students who do simple practicums, the majority are skilled and careful in carrying out simple practicums for learning chemistry"
(Researcher Observation Sheet, 7 April 2022)

Students are 35 percent through with using practicum tools and materials, as well as carrying out each practicum step, for example, pouring natural indicator extracts into each class in the same amount and slowly. In the video, it can be seen that 35 students are very concerned about the cleanliness of the tools used, namely by using one spoon and a container for each ingredient. 35 students used additional text to explain each practicum step carried out.

In a simple chemistry learning practicum, 35 students used vinegar, table salt, and baking soda. The suitability of the practicum results is appropriate and in accordance with the literature. In addition to being thorough and skilled in carrying out practicums, students 35 make practicum reports in a complete, clear, and attractive manner. The structure of the contents of the student report is in accordance with the instructions given by the researcher. The contents

of the report start from the title to the bibliography. The explanation above is supported by the data on the observation sheet as follows:

> "*But there were also those who were very neat and organized in making the video starting from the purpose, the method of work, the practicum was also very good, and the results were explained in detail."*
> ***(Observation Sheet, March 18, 2022)***

The same thing was done by several other students, such as students 9,11,30,37, and 38. Based on the practicum report, it can be seen that there were also several students who were skilled, but paid little attention to the cleanliness of the tools they used. This is supported by the following observer and researcher observation sheet data:

> *"There are also students who use a stirrer to stir all the tested solutions, this is feared there will be contamination between one solution and another."*
> ***(Observation Sheet, March 18, 2022)***

Based on the explanation above, almost all students have good practicum skills. The flipped classroom approach using a variety of digital learning media has a positive effect on students, as can be inferred from the explanation of the learning outcomes above. This is consistent with a number of earlier studies that found the use of the flipped classroom had a positive effect on students' learning outcomes (Flynn, 2015; Ryan & Reid, 2016).

CONCLUSION AND RECOMMENDATIONS

Based on the results of research conducted at Senior High School 12 Depok, West Java, Indonesia, it was concluded that the application of the flipped classroom learning model with a variety of digital learning media can build student activity in the chemistry learning process. This is indicated by the development of student activities well seen from both dimensions, namely the student's response to instructions and the type of instruction. The dimensions of student response to instructions are very visible during learning, this is due to variations that trigger learning, namely by using a variety of learning media, such as power point, Miro, Wizer.me, Google Classroom, Mentimeter, and learning chemistry learning videos make students interested in the learning process.

The stages of activities while in class are the stages that best show student responses to instructions which can be seen from the activeness and enthusiasm of students during learning activities. The use of digital learning media and the involvement of students in completing students' worksheet as a group are the main factors in the development of student activities. The dimensions of the type of instruction can be received during flipped classroom learning using a variety of digital learning media. Students work together in solving problems in students' worksheet. Student activities carried out relate to student learning outcomes. Student learning outcomes in the cognitive domain increased compared to learning using previous learning models. This is shown from the results of cognitive tests that are above the minimum criteria. Based on the assessment rubric used, learning outcomes in the affective and psychomotor domains of XI MIPA 2 students showed positive results. Learners' attitude of responsibility, discipline, courage to express opinions, and cooperation in groups. While the psychomotor domain is viewed from the thoroughness of using tools and materials, doing practicum, and practicum reports.

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