

# THE EFFECT OF THE FLIPPED CLASSROOM MODEL ASSISTED GOOGLE CLASSROOM ON LEARNING RESULTS AND STUDENT'S RESPONSES IN SUBJECT STRAIGHT MOTION DYNAMICS IN SENIOR HIGH SCHOOL

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## ABSTRACT

The low physics learning outcomes of students are influenced by several factors, namely the selection of learning models and media that are less supportive so students are less responsive to learning. The purpose of this study is to examine the effect of the Flipped Classroom model assisted by Google Classroom on student learning outcomes and describe student responses to the Flipped Classroom model assisted by Google Classroom on straight-motion dynamics material. This research is an experimental research using a posttest-only control group design. The sample selection was done by cluster random sampling method. Data collection methods consist of observation, interviews, documentation, written tests, and questionnaires. The data analysis technique of learning outcomes used an independent sample t-test, while student responses used score criteria. The results showed that the Sig. (2-tailed) in the t-test using SPSS is 0.000 ( $\leq 0.05$ ). Then, for the results of experimental class student responses, the results of the response aspect were 82.58% and the reaction aspect was 83.44%, both of which were in the interval  $80 \leq P \leq 100$  with a very good category. The conclusion obtained is that there is a significant effect of the application of the Flipped Classroom model assisted by Google Classroom on the learning outcomes of students of SMAN 3 Jember on the material of the dynamics of straight motion. Then, the results of student responses to the application of the Flipped Classroom model assisted by Google Classroom on the material of the dynamics of straight motion obtained positive responses and reactions and included in the very good criteria.

**Keywords:** *Flipped Classroom Model, Google Classroom, Straight Motion Dynamics, Student Learning Outcomes, Student Response*

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## INTRODUCTION

The importance of education is to acquire knowledge, skills, and other qualities. There are many changes, in education in Indonesia during this period, and the demands of the learning process must also be in line with the development of science and technology (Rahmadani et al., 2022). Student-centered learning to be actively involved is a hallmark of 21st-century learning. The desired goal is not only the success of learning outcomes that have been achieved, but also in the learning process students explore knowledge and improve self-efficacy. This is one of the challenges for students when studying at school. One of the things that is difficult for students to learn is physics. Based on the report of the Education Assessment Center of the Ministry of Education and Culture, in 2019, the mean results of the National Science Examination (UN) in Jember Regency were 44.73; biology 51.97; and chemistry 53.87. This shows that physics is a learning subject with the mean value obtained is still low compared to scores in other science subjects. Therefore, to support physics learning, learning models and media are needed that can motivate students.

Low student learning outcomes or lack of student responsiveness in the learning process arise due to a lack of interest in participating in physics learning. Based on this, with Flipped Classroom, you can create a learning model that suits your learning style, student character, material, and technology. Albalawi (2018), in his research, suggested the application of a flipped-classroom approach to be able to motivate learning and improve student learning outcomes. The advantages of the flipped classroom model include time efficiency, the ability to explore and perfect more broadly, the learning process becoming more interesting, and stimulating student creativity. Meanwhile, the weaknesses of the flipped classroom model include the lack of adequate facilities and infrastructure it has the potential to become a burden on teachers and requires extra supervision and support (Farhan et al., 2023).

In addition, the use of learning media is also important as a supporting component, for example, Learning Management System (LMS). Google Classroom with an LMS system is considered effective because it can be used for communication, interactivity, ease of use, and also student satisfaction response (Azhar & Iqbal, 2018). The use of Google Classroom can also help students to be more active in discussing, doing assignments, and digging into material, so that student understanding will be broader and deeper (Sappaile et al., 2020). The advantages of this Google Classroom media include making it easier for teachers to control students in more than one class, making it easier for students and teachers to access materials or assignments, and teachers and students to have more time to communicate online. Meanwhile, weaknesses in this media, among others, are not easy for teachers to respond to student responses simultaneously, students tend to plagiarize assignments, and not all schools can support this media because of network problems (Fauziah et al., 2021).

A complex activity is called learning, and the learning outcomes are called competencies (Hapudin, 2021: 3). Maruwae (2022: 16) also argues that the learning process is considered an actualization process that aims to achieve educational goals so that the learning outcomes obtained from the learning process are considered as the achievement of educational goals. Based on the theory of behaviorism, learning is a result of the interaction between stimulus and response, thus causing changes in behavior. If they can show changes in their behavior as seen from their academic performance, then students are considered to have learned something (Wahyuni et al., 2020: 15). Therefore, student responses in learning activities are closely related to the acquisition of learning outcomes.

Based on research by Sahlan et al. (2022), stated that the average student gave a very positive response to physics material on the questionnaire question by 84%. Sappaile et al. (2020) in their research also stated that the application of the Flipped Classroom model with Google Classroom in learning obtained an average learning outcome of 72.08 which means better when compared to using a conventional learning model of 63.44. In line with the research of Yanah et al. (2018) stated that the flipped classroom model influences learning and increases the ability to learn independently and mastery of students' physics concepts. Meanwhile, the research of Yanah et al. (2018) stated that learning devices with flipped classrooms were declared valid, practical, interesting, easy to apply, and useful. However, to improve student learning outcomes, these devices have low effectiveness on harmonic oscillations and motion impulses.

SMAN 3 Jember is a place for researchers to participate in the Teaching Assistance (Asjar) program, so researchers also make the school a place to conduct research. Observations

and interview results with one of the physics teachers of SMAN 3 Jember, show that until now the students' response to physics learning is still low. This happens because physics subjects are still considered difficult, such as straight-motion dynamics which are more centered on concepts and the use of formulas depending on the state of the object. The low response and enthusiasm of students in learning physics have an impact on the low academic achievement of students. Judging from the above problems, researchers want to research the application of the Flipped Classroom model supported by Google Classroom media on straight-motion dynamics material, to support the success of SMAN 3 Jember students in learning physics.

## **METHOD**

This research applies a quantitative approach through experimental methods. The research design used was Posttest-Only Control Group Design.

Table 1. Research Design Pattern (Sugiyono, 2020:116)

Class			
R	Experimental Group (E)	X	O <sub>2</sub>
R	Control Group (K)	-	O <sub>4</sub>

Determination of samples using the Cluster Random Sampling method with homogeneity tests. A total of two classes were selected as experimental groups and control groups from the entire class XI of science at SMA Negeri 3 Jember. The implementation of research in the first semester of the 2023/2024 academic year with the subject of straight-motion dynamics.

Data collection techniques in this study are as follows:

1. Written test

Posttest questions in the form of reasoned multiple choice with a total of 5 questions. The calculation of learning outcome scores on a scale of 0-100 can use the following equation:

$$\text{Score} = \frac{\text{Scores obtained}}{\text{Score maximum}} \times 100\%$$

2. Questionnaire

The questionnaire was used to collect student response data totaling 5 written statements. This questionnaire is distributed to experimental classes with the intent to assess student responses to learning using the Flipped Classroom model powered by Google Classroom.

3. Observation

Observation is an observation technique carried out to determine the condition of the object of research to be studied, ranging from school, and class, to students who will be treated.

4. Interview

Interviews were conducted twice, before and after the study. Before the study, interviews were useful for collecting preliminary information about the learning system in the intended school. Interviews conducted after learning are useful for assessing the responses of experimental class students to the learning model applied.

5. Documentation

Documentation is carried out before, during, and after the study so that there is evidence that the research carried out is true. The selected documentation includes a list of student names, test scores, control and experimental class learning activities, and others.

Data analysis was performed using SPSS 25. The data analysis technique used to test the effect of the Google Classroom-assisted Flipped Classroom model on student learning outcomes on straight-motion dynamics material is the Independent Sample T-Test. The statistical hypothesis of student learning outcomes is as follows:

H<sub>0</sub>: Learning outcomes of experimental class students = learning outcomes of control class students

H<sub>a</sub>: Learning outcomes of experimental class students ≠ learning outcomes of control class students

Then, the results are analyzed based on testing criteria. A significance value of ≤ 0.05 indicates that H<sub>0</sub> is rejected and H<sub>a</sub> is accepted, which means that there is a significant influence on the application of the Google Classroom-assisted flipped classroom model on the learning outcomes of SMAN 3 Jember students on straight-motion dynamics material. Meanwhile, a significance value of > 0.05 indicates that H<sub>0</sub> is accepted and H<sub>a</sub> is rejected, which means that there is no significant effect on the application of the Google Classroom-assisted flipped classroom model on the learning outcomes of SMAN 3 Jember students on straight-motion dynamics material.

Student response data was analyzed using questionnaire results that had been distributed to the experimental group after the study. The questionnaire of student responses regarding the Google Classroom-assisted Flipped Classroom model has criteria with a scale of 5.

Table 2. Assessment Criteria (Sugiyono, 2020:147)

Criterion	SS	S	KS	TS	STS
Score	5	4	3	2	1

Then, the score and percentage are calculated using the following formula:

$$\text{Student response result} = \frac{\text{Scores obtained}}{\text{Score maximum}} \times 100\%$$

Table 3. Student Response Score Interpretation Category (Arikunto, 2020:319)

Score Interval (%)	Category
$80 \leq P \leq 100$	Excellent
$60 \leq P < 80$	Good
$40 \leq P < 60$	Enough
$20 \leq P < 40$	Less
$0 \leq P < 20$	Very Lacking

## RESULTS AND DISCUSSION

### Results

SMA Negeri 3 Jember was used as a research location, by taking the entire population from all XI Science consisting of four classes. The homogeneity test using SPSS 25 against the four classes using the results of repeated previous material, was carried out as an initial stage of sample determination. The results of the homogeneity test, obtained a significance value of 0.806 (> 0.05), meaning that all populations have the same variance (homogeneous). Furthermore, the determination of the sample is then carried out using cluster random sampling,

where the population is divided into several groups (clusters) that may have variations or differences between them. Then, randomly select multiple clusters to take as samples. The selected sample was class XI Science 1 consisting of 34 students as a control class and XI Science 4 consisting of 31 students as an experimental class.

**Analyze the Effect of Google Classroom-Assisted Flipped Classroom Model on Student Learning Outcomes**

A hypothesis test using an Independent Sample T-test is a test conducted to investigate the influence between control class variables and experimental classes.

Table 4. Statistical descriptive results

Group Statistics					
	Class	N	Mean	Std. Deviation	Std. Error Mean
Student Physics Learning Outcomes	Control Class	34	59.32	18.607	3.191
	Experimental Class	31	80.71	11.519	2.069

Based on the statistical descriptive results above, the scores of the two classes can be analyzed. First, the control class had 34 students with the lowest post-test score was 10 and the highest post-test score was 91. The mean is 59,32 and the standard deviation is 18.607. Second, the experimental class had 31 students with the lowest post-test score of 52 and the highest post-test score of 95. The mean is 80,71 and the standard deviation is 11.519. The control class had a lower score than the experimental class. As for graphically, the data can be described as follows.

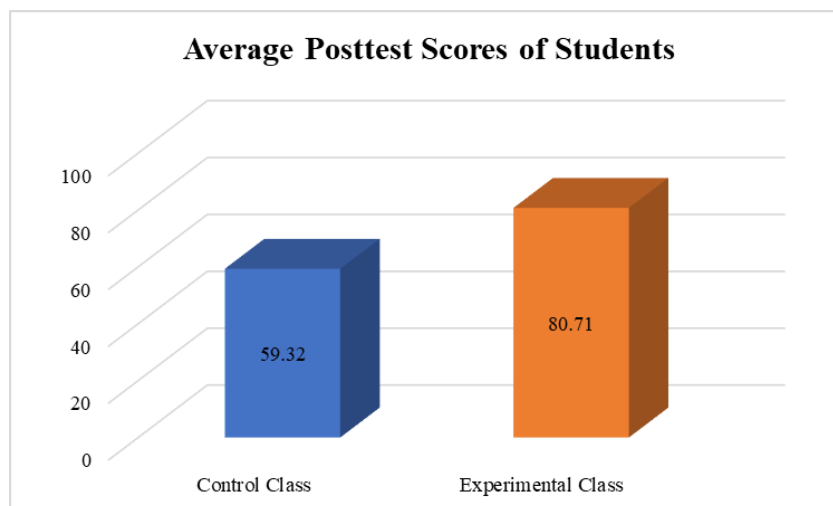


Figure 1 Graph of average student learning outcomes

Based on figure 1 above, shows that the average learning outcomes of students in the cognitive realm between the control class and the experimental class show differences. It can be concluded that the physics learning outcomes of experimental class students are greater than those of the control class.

Table 5. Independent sample test results T-Test

Independent Samples Test											
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
										Lower	Upper
Student Physics Learning Outcomes	Equal variances assumed	5.393	.023	-5.507	63	.000	-21.386	3.883	-29.146	-13.626	
	Equal variances not assumed			-5.623	55.738	.000	-21.386	3.803	-29.005	-13.767	

The data output above shows a Sig. (2-tailed) value of 0.000 ( $\leq 0.05$ ). Based on this statistical hypothesis,  $H_0$  is rejected and  $H_a$  is accepted, which means that the learning outcomes of the experimental class are different from the learning outcomes of the control class, for the learning outcomes of the experimental class are higher than the learning outcomes of the control class ( $\mu_E > \mu_K$ ). Referring to the research hypothesis, there is a significant difference between the experimental class and the control class, it can be said that there is an influence of the Google Classroom-assisted Flipped Classroom learning model on student learning outcomes on straight-motion dynamics material.

### Analysis of Student Response Data

Student response data taken from the results of questionnaires distributed to experimental classes are processed to determine student responses to the flipped classroom learning model supported by Google Classroom media that has been implemented. The data were analyzed by calculating percentages using formulas and measured based on the interpretation criteria of the obtained student response scores. The results of the recapitulation of student responses based on indicators can be seen in the following table.

Table 6. Recapitulation of student response percentage for each indicator

Aspects	Indicator	Indicator Values	Aspect Value	Category
Responses	Format	77,41%	82,58%	Excellent
	Relevance	87,74%		
Reaction	Attention	75,48%	83,44%	Excellent
	Satisfaction	87,74%		
	Confident	87,09%		

The recapitulation graph of student responses when viewed from student learning outcomes is as follows.

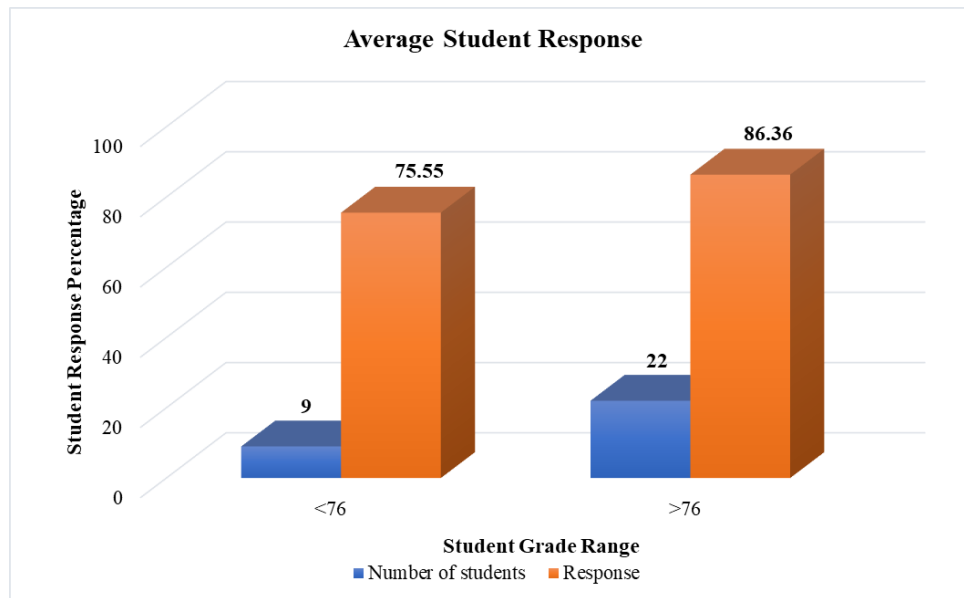


Figure 2. Graph recapitulation of student responses in terms of student learning outcomes

Figure 2 above, shows a comparison between student responses and student learning outcomes. A total of 9 students with scores below KKM (<76) received an average student response score of 75,55. Meanwhile, as many as 22 students with scores above KKM (>76) received an average student response score of 86,36.

## Discussion

The first objective of this study is to examine the effect of the Google Classroom-assisted Flipped Classroom model on the learning outcomes of SMAN 3 Jember students on straight-motion dynamics material. The experimental class, namely XI IPA 4, applies the flipped classroom learning model supported by Google Classroom. The control class, namely XI Science 1, did not use the model but applied PBL as a learning model used by physics teachers in schools. Learning in both classes was carried out four times, namely three times teaching in class and one posttest. In both classes, the first meeting of students studied Newton's laws, the second meeting about the types of forces acting on objects, and the third meeting about frictional forces. The learning outcomes assessed are cognitive domains ranging from C1, C2, C3, and C4 a total of 5 reasoned multiple-choice questions. Learning in the experimental class is adjusted to the syntax of the flipped classroom model, namely in every meeting students conduct learning at home (pre-class) by accessing materials and videos in Google Classroom and recording important points. Then, during in-class learning, students apply and analyze the concepts they have learned themselves with PhET Simulation, practice questions, and fill out LKPD, discussions, presentations, and demonstrations directly in class to prove and equalize perceptions. After that, they evaluate the knowledge gained by doing quizzes at home as assignments, and will be discussed at the next meeting (out of class). Independent learning of students at home both pre-class and out-of-class stages, is controlled by providing a collection column in Google Classroom, where teachers can monitor students who have not and have collected the results of their notes or assignments. In addition, the teacher also provides a discussion column for students if there are obstacles or questions.

Meanwhile, learning in the control class is adjusted to the PBL model. At each meeting, students are given problems in the form of LKPD regarding the material discussed. After that, a presentation is made and the teacher explains how to strengthen the material.

The results obtained in the first objective by looking at the t-test show that the use of the flipped classroom model supported by Google Classroom media has a significant effect on student learning outcomes. Based on statistical descriptive analysis, it is known that the mean learning outcomes of the experimental class are greater than the learning outcomes of the control class. The increase in experimental class learning outcomes is influenced by special treatment, namely the application of the flipped classroom learning model. This model requires students to explore their knowledge independently at home or before classroom learning activities take place. Students can explore and elaborate knowledge more broadly, and the efficiency of time in learning can be a stimulus for students in spurring creativity.

In addition, with the help of Google Classroom which has various features, students can take advantage of digital technology as a learning medium. The "classwork" feature aims to help students more easily access the material or assignments given by the teacher for them to learn first before class. The "comment" feature aims to help students more easily ask questions or discuss with either teachers or friends about material that they do not understand. For students who want to ask questions personally to the teacher, there is a "people" menu to make it easier for introverted students to send questions. Teachers can easily share materials, videos, LKPD, and quizzes in all formats (doc., pdf, or link) through the "create material" feature. Google Classroom is a digital learning media that can help and encourage students to learn independently at home, and then strengthen their knowledge through teacher explanations in class, and the existence of quizzes at the end of learning that can be done at school during free hours or at home further deepen students' knowledge of the material they learn. This difference in treatment affects the difference in student learning outcomes between experimental and control classes.

The results of this study are relevant to previous research by Rahmadani et al. (2022) which stated that digital-based learning with a flipped classroom learning model is a solution to help students access learning resources in unlimited time and space. Research by Agustiono et al., (2020) also states that applying a blended learning model supported by Google Classroom media can increase student learning independence. Learning that students do at home, encourages them to be more independent in understanding something as their initial knowledge, and that knowledge will be brought to be explored and proven in class about the correct concepts.

Based on constructivist learning theory, flipped classrooms encourage students to be active and independent in building their knowledge, allowing students to access material ahead of time and use class time to interact directly with teachers and fellow students. Greater opportunities for students to build a deep understanding of the subject matter (Purnomo et al., 2022). The technology used in the flipped classroom aligns with Bruner's view that emphasizes the importance of using visual and narrative tools to facilitate student understanding. Google Classroom as an online learning platform allows the use of technology to present learning materials interactively and engagingly. This technology can help students understand complex concepts through videos, simulations, and other digital resources. In addition, students can

practice mastering the use of these media, to be able to understand the learning flow at home both at the pre-class and out-of-class stages (Sundari & Fauziati, 2021).

The second purpose of this study is to describe the response of SMAN 3 Jember students to the Google Classroom-assisted Flipped Classroom model on straight-motion dynamics material. Assessment of student responses is only carried out in experimental classes, namely XI Science 4 consisting of 31 students to assess students' views and responses to the learning model that has been implemented in the class. The student response assessment instrument is in the form of a questionnaire consisting of 5 statements representing each indicator, namely format, relevance, attention, satisfaction, and confidence. The results of student response data on the response aspect showed that for the format indicator, a percentage of 77.41% was obtained in the good category, and the relevance indicator of 87.74% in the very good category so by applying the flipped classroom model supported by Google Classroom media obtained a positive response of 82.58% in the very good category. Then, the results of student response data on the reaction aspect showed that the attention indicator obtained a percentage of 75.48% in the good category, a satisfaction indicator of 87.74% in the very good category, and a confidence indicator of 87.09% in the very good category, so that the application of the flipped classroom model was assisted by Google Classroom obtained a positive reaction of 83.44% in the very good category. Figure 2 shows a comparison graph of student responses between students who scored below KKM and those above KKM. These results show that the value of learning outcomes achieved is proportional to student responses to learning, the more positive student responses and reactions to the learning model, the better the learning outcomes achieved.

The results of the positive student response obtained were influenced by the flipped classroom model that had never been applied before in schools and Google Classroom media. Students have never previously learned with the flipped classroom model, in learning students when in class listen to the teacher's explanation directly. However, with this model students are trained to learn independently as much as they can and as much as possible, bringing their knowledge into the classroom for the exploration process with the teacher, making students enthusiastic in classroom learning. Likewise, with the help of Google Classroom media which is usually only a teacher forum for giving and collecting assignments. However, Google Classroom in this study was packaged as an LMS to facilitate students to learn independently. The existence of various learning materials both in the form of text and video provided by the teacher frees students to learn to understand the material according to their wishes and learning styles. In addition, the evaluation stage at the end of learning with the provision of interesting quizzes that can be accessed through Google Classroom as assignments at home, makes students not lazy in doing it. Therefore, the existence of a flipped classroom learning model and flexibility of study time at home, as well as strengthening material while in class, are considered new things for students. Students are more enthusiastic about learning so students also give a positive response to the learning.

The results of this study fit with Skinner's theory "a process of progressive behavior adaptation" that individuals constantly adjust their behavior based on their learning experiences with the environment. This process involves the gradual formation and change of behavior towards more adaptive and desirable behaviors that are visible from the learning outcomes, in line with the response to the external stimulus provided (Hapudin, 2021). Thorndike's theory

also suggests that positive and negative reinforcement have a major influence on student response. Students tend to respond better to positive reinforcement, i.e. praise, reward, or satisfactory outcome, and tend to avoid responses that previously resulted in negative reinforcement, such as punishment or undesirable outcomes. In this case, students who get praise for their good assignments will be motivated to do better next. Meanwhile, students whose assignments are not good and the teacher punishes them for doing assignments outside the classroom, tend not to repeat it in the next learning (Sipayung & Sihotang, 2022).

The research of Sahlan et al., (2022) stated that the use of Google Classroom media had a good impact and received a positive response to the online physics learning experience. The existence of new learning models and media can motivate students to explore their curiosity which makes their response or enthusiasm to the stimulus given increase. Positive responses tend to be driven by previous positive experiences, effective learning, and supportive personality values, while negative responses tend to be triggered by negative experiences, difficulties in the learning process, or conflicts with students' personality values. The new learning situation with the flipped classroom model and Google Classroom media can generate positive student responses to learning.

Based on the discussion of the two research objectives above, applying the flipped classroom model supported by Google Classroom media in reviewing student learning outcomes obtained significant results, the learning model was able to support students' physics learning outcomes to increase. Then, based on the results of student responses that have been analyzed show a positive response to the learning model applied in class. The success of this research in achieving the desired goals is not only from teachers. The role of students who are enthusiastic about participating in learning is also very helpful in the success of implementing the learning model. In addition, the existence of good collaboration between schools and researchers greatly supports the implementation of learning and success in this research.

## **CONCLUSION**

The conclusion that can be drawn from the results and discussion above is that there is a significant influence on the application of the Google Classroom-assisted Flipped Classroom model on the learning outcomes of SMAN 3 Jember students on straight-motion dynamics material. In addition, student responses to the application of the Google Classroom-assisted Flipped Classroom model on straight-motion dynamics material received positive responses and reactions and were included in the excellent criteria.

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