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Online Learning Using Google Incorporated for Student High School: Mapping Motivation Using Rasch Model in Physics Learning

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Abstract

This study aimed to determine the motivation level of high school students during online learning using Google Incorporated. This research is included in the type of survey research. The survey was conducted in one high school in the city of Yogyakarta. Respondents consisted of 32 people (L = 46% and P = 54%) students of class X. Student motivation was evaluated using a motivational instrument consisting of 14 items and spread over three aspects: motivation, self-efficacy, and responsibility. The instrument uses a 5-point Likert scale, from Strongly Disagree (1) to Strongly Agree (5). The level of student motivation was analyzed using the Rasch model with the Logit Value of Person (LVP) technique combined with the Wright map and Differential Item Functioning (DIF). The analysis results show that 41% of students have a moderate level of motivation, 25% at a high level, 19% at a very high level, and 16% at a low level. The results of the DIF analysis show that one of the items (Re4) in the Responsibility aspect tends to benefit female students. This has implications for the emergence of student interest in studying physics.

Keywords: Google Incorporated; Online Learning; Rasch Model; Student Motivation

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INTRODUCTION

Implementing online learning is a response from all schools to limit direct contact with school residents during the Covid-19 pandemic (Adams et al., 2021). Various online learning models were adopted and applied to reduce the impact of the spread of the virus. In order to maintain the continuity of education, schools are making forced

transitions from emergency learning to e-learning to lead to a realignment of the teaching process (Kulikowski et al., 2021). This situation creates an entirely new situation for most students. E-learning, which is imposed as an emergency teaching technique (Hodges et al., 2020), has the potential to cause stress for students and even has the potential to reduce students' learning

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motivation. This may pose a severe challenge for students. During online learning, students may lack focus, may not have access to all necessary learning tools and materials or may not be present online learning (Yusuf, 2020).

Rapid technological advances have become the starting point for giant companies such as Google to create various innovations for learning. Google has developed various learning features to support online learning. All learning features have been integrated in one form of Google Incorporated. Google Classroom is a free application designed to help students and teachers stay connected, work together, organize and create assignments, and make it possible to make learning paperless (Hussaini et al., 2020). Harjanto and Sumarni (Harjanto & Sumarni, 2019) mention some of the benefits obtained from using google classroom, namely: 1) Management, where in google classroom, a teacher can share material in various forms, such as video, audio, forms and files, 2) Flexibility, students and teachers are given access to be able to use the features available on Google Classroom from each computer or smartphone, 3) Security, a student can join the class if he receives a code or based on the teacher's invitation via email. This means that there is a small possibility of a stalker trying to join the class, 4) Collaboration, Students can collaborate with other friends through the discussion page to increase students ability to discuss, understand a problem and solve it. Various studies have reported the positive impact of using Google Classroom in learning. During the pandemic, the use of google classroom increased student learning effectiveness (Marbun & Sinaga, 2021). In addition, using Google Classroom received positive perceptions from students and was very useful in improving skills, abilities, discipline, and

learning independence (Oktaria & Rahmayadevi, 2021).

Google Forms and Google Meet also have an important role in online learning. Google Form has a main function, namely to create a form (Munawaroh et al., 2021). In its implementation in the world of education, the google form can be used to evaluate students' learning outcomes (Forutanian, 2021; Munawaroh et al., 2021; Utami, 2021). With the features that are owned and the appearance is quite attractive, it makes students more enthusiastic about doing the evaluation given by the teacher (Mardiah, 2021). Google Meet is one of the answers to new problems in the implementation of online learning so far. With Google Meet, online learning can be done with a synchronous model, where teachers and students study simultaneously in a virtual room. As a result, with this model, students have a new spirit and are more motivated to participate in online learning.

Using the three Google products in virtual classes is considered to provide new motivation to students so that they are more active in learning, especially in science lessons. This is because students can learn at any time through material that has been shared in Google Classroom, as well as the creation of synchronous learning using Google Meet accompanied by online simulations. The transfer of knowledge, motivation is one of the internal factors that considerably influence the success of the learning process for individual students.

According to Janštová & Šorgo (2019), motivation has three components: motivation, self-efficacy and responsibility. These three components contribute to the success of the process of receiving knowledge for individuals. Glynn et al. (2011) suggest that motivation is an internal driving force from within a student to carry out certain activities in order to achieve a predetermined goal in learning science.

Yıldırım and Güler (2020) define self-efficacy as a general concept that refers to an individual's ability and belief that they can complete a given job or task. Skills are needed, and a strong belief in one's capabilities or abilities to control individual motivation and behaviour. Then responsibility has an important role for an individual. Hassandra and Goudas (2010) state that responsibility is an important characteristic that can affect individual success in school. In addition, responsibility is a provision for individual preparation in the future when they enter society.

Several recent studies show that many researchers discuss products from Google Incorporated in implementing online learning. For example, the effectiveness of the Google Classroom-based physics learning system in increasing students' learning motivation (Sukesti & Sulisworo, 2021), the application of Google Meet to increase student motivation (Huda et al., 2022) and Evaluation of learning outcomes through Google Form-based tests (Sari & Ahsani, 2020). Given the limited literature that discusses Google Incorporated in increasing student motivation, this study aims to assess the use of Google Incorporated in online learning on motivation using the Rasch model.

METHOD

This research is included in the type of survey research. The subjects of this study involved 32 grade 10 students from one of the public high schools in the city of Yogyakarta and were taught using Google Incorporate in physics lessons. The students comprised 14 (46%) boys and 18 (54%) girls. The age range of students ranges from 15-16 years.

Student motivation is administered using an instrument developed by

Janštová and orgo (2019). The instrument consists of 14 items spread over three factors, namely Motivation (Mo), Self-efficacy (SE), and Responsibility (Re). Factor Motivation consists of 7 items, Self-efficacy consists of 3 items, and Responsibility consists of 4 items. This instrument uses a 5-point Likert scale. Scale 1 represents Strongly Disagree, 2 represents Disagree, 3 represents Uncertain, 4 represents Agree, and 5 represents Strongly Agree.

Physics Education lecturers assessed the instrument's feasibility before it was used. Translated items are formatted in Google online surveys. Respondents filled out the instrument through the WhatsApp group. Student participation is completely anonymous. The data collection process took about two weeks.

Student responses were analyzed using Excel 2019 and Winsteps 4.6.1. Student motivation was evaluated using Logit Value of Person (LVP, see Table 1) combined with Wright map and Differential Item Functioning (DIF). The LVP and Wright map is used to see the level of student motivation, and DIF is used to assess the tendency of items in each factor based on gender. The validity of the items in the instrument is fulfilled if the outfit MNSQ value is 0.5 to 1.5 logit, the outfit ZSDT value is from -2 to +2, and PT. Mea Corr. between 0.4 to 0.8 (Sumintono & Widhiarso, 2014). Reliability is viewed from the aspect of the item, person and instrument reliability. Reliability is met if the value is at least 0.70. The difficulty level of items is grouped by Logit Value of Item (LVI, see Table 2).

Table 1 Student motivation level criteria

Logit range of values	Criteria
$LVP \geq M + SD$	Very high
$M \leq LVP < M + SD$	High
$M - SD \leq LVP < M$	Moderate
$LVP < M - SD$	Low

(Setiawan et al., 2018)

Table 2 Item difficulty criteria

Logit	Range of values	Criteria
$LVI \geq M + SD$		Very difficult
$M \leq LVI < M + SD$		Difficult
$M - SD \leq LVI < M$		Easy
$LVI < M - SD$		Very easy

(Setiawan et al., 2018)

RESULT AND DISCUSSION

Instrument Reliability

Table 3 describes the statistical summary of students' motivational instruments for online learning using Google Incorporated.

Table 3 Summary of Statistical Instruments of Student Motivation Towards Learning Using Google Incorporate

	Measure		Strata	Reliability	Cronbach's α
	Mean	SD			
Item	0.00	0.91	3.53	0.85	0.86
Person	1.90	1.46	3.49	0.85	

Table 3 shows that the average logit item value is 0.00 with a standard deviation of 0.91, and the average logit value is 1.90 with a standard deviation of 1.46. This shows that the level of student perception of online learning using Google Incorporated is higher than the difficulty level of the items used. The item strata are 3.53, and the person strata are 3.49. Strata values on items and persons can be rounded up to 4. This shows that items and persons can be grouped into 4 groups (see Tables 1 and 2). The reliability of each item and person is 0.85. At the same time, the reliability of the instrument is 0.86. The three reliability values are included in the good category (Ismail et al., 2020). Item reliability shows the quality of the items, person reliability shows the consistency

of student answers, and instrument reliability (Cronbach's α) shows the interaction between the person and the items as a whole (Sumintono & Widhiarso, 2015). So, it can be concluded that the items used are of good quality and students respond consistently. In addition, people and items have a good interaction. This reliability value is better than the reliability value previously reported by Janštová and Šorgo (2019).

Instrument validity

After evaluating the reliability, the instrument's validity is evaluated through the fit of the item to the model. Table 4 summarizes the validity or suitability of the items in the instrument used.

Table 4 Summary of The Validity of The Motivational Instrument

Item	Measure (Logit)	Infit MNSQ	Outfit		PT. Mea Corr.	Criteria
			MNSQ	ZSTD		
Mo1	-0.83	1.08	1.01	0.14	0.55	Fit
Mo2	0.25	1.07	1.16	0.68	0.49	Fit
Mo3	1.56	1.54	1.52	1.94	0.66	Maintained
Mo4	1.29	0.67	0.67	-1.46	0.61	Fit
Mo5	0.55	0.71	0.70	-1.23	0.66	Fit
Mo6	0.05	1.00	0.93	-0.18	0.61	Fit
Mo7	0.25	0.97	0.90	-0.29	0.68	Fit
SE1	-0.05	0.82	0.74	-0.92	0.72	Fit
SE2	-0.71	1.77	1.50	1.40	0.46	Fit
SE3	-0.49	0.64	0.58	-1.50	0.77	Fit
Re1	-0.83	0.46	0.42	-2.05	0.75	Maintained
Re2	0.05	0.93	1.07	0.33	0.51	Fit
Re3	0.93	1.06	1.18	0.78	0.54	Fit
Re4	-2.02	1.40	1.46	0.89	0.29	Maintained

Table 4 shows that the items have an outfit MNSQ value ranging from 0.42 to 1.52, an outfit ZSTD value from -2.05 to 1.94, and a Pt. Mea. Corr value from 0.29 to 0.77. Based on the outfit values, 10 MNSQ, ZSTD and Pt. Mea. Corr, 11 items have a good fit to the model and 3 (Mo3, Re1, and Re4) have a poor fit to the model but are maintained because they are still within tolerance limits. The Mo3 item is maintained even though it has an outfit MNSQ value of 1.52 because the MNSQ outfit value 1.5 – 2.0 has poor implications in making instruments but does not reduce quality (Sumintono & Widhiarso, 2015). Item Re1 is retained even though it has outfit ZSTD -2.05 because the outfit MNSQ values and Pt. Mea. Corr meets the criteria. Item Re4 is maintained even though it has a Pt. Mea. Corr value of 0.29 because the outfit MNSQ and ZSTD values are still within the acceptable limits. So that these three items (Mo3, Re1, and Re4) are maintained, no need to change. So, it can be concluded that 14 items can be used to assess student motivation.

Item difficulty distribution

After getting a valid and reliable instrument, they group the 20 items based on the difficulty level. Based on the results of the strata analysis in Table 3, the items can be grouped into 4 groups. Table 5 describes the grouping of items on the motivational instrument based on the difficulty level.

Based on Table 5, the difficulty level of 14 items is grouped based on the average logit value of the item (0.00) and its standard deviation (0.91) (Setiawan et al., 2018). The grouping of items refers to the logit value of each item in Table 4. Items on the motivation component are distributed in the Easy (1 of 7 items, 14%), Difficult (4 of 7 items, 57%), and Very Difficult (2 of 7 items, 29%). All items in the Self-efficacy component are distributed in the Easy category. Items in the Responsibility component are evenly distributed at all levels of difficulty. A good instrument if all items are distributed in each category of difficulty level so that it can provide accurate information about the level of student motivation.

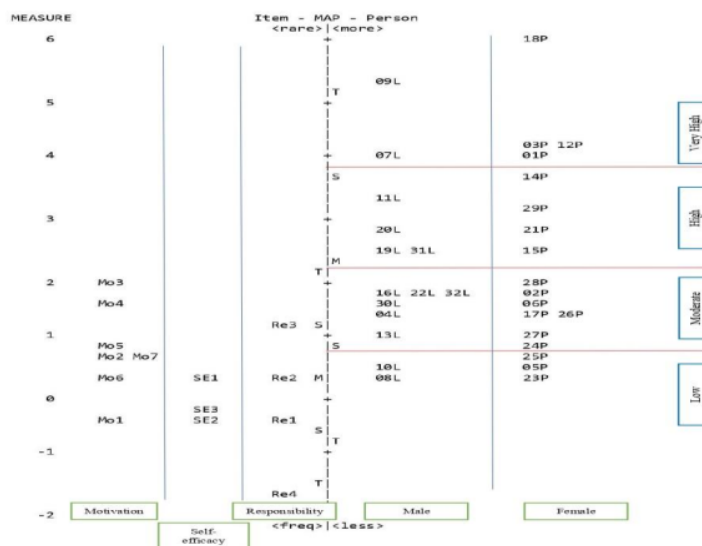


Figure 1 The Level of Student Motivation by Gender During Online Learning

Tabel 5 The Difficulty Level of The Items in The Motivation Instrument

Difficulty Level	Component		
	Motivation	Self-efficacy	Responsibility
Very Easy			Re4
Easy	Mo1	SE1, SE2, SE3	Re1
Difficult	Mo2, Mo5, Mo6, Mo7		Re2
Very Difficult	Mo3, Mo4		Re3

Student motivation level

The grouping of students' motivation levels was carried out based on the logit value of the person (1.90) and the standard deviation (1.46) combined with the Wright map. Referring to Table 1 and Table 3, the respondents were grouped into 4 groups. Figure 1 shows the level of student motivation during online learning using Google incorporate.

Based on Figure 1, most of the students (13 out of 32, 41%) had a moderate level of motivation. Six out of 32 students (19%) have very high motivation. At the same time, the other students were distributed at high (25%) and low (16%).

The use of Google incorporated has fostered student motivation in studying physics. These results are in line with the research results conducted by previous researchers. Sukesti and Sulisworo (2021) found that the application of learning using Google Classroom effectively increased student motivation in the very good category. Students find it easy to use Google Classroom when learning. In addition, students feel learning becomes more interesting and not monotonous. In line with the implementation of google classroom, Huda et al. (2022) apply to learn using Google meet to elementary school students. They found that the implementation of google meet in action research could increase students' learning motivation so that it has an

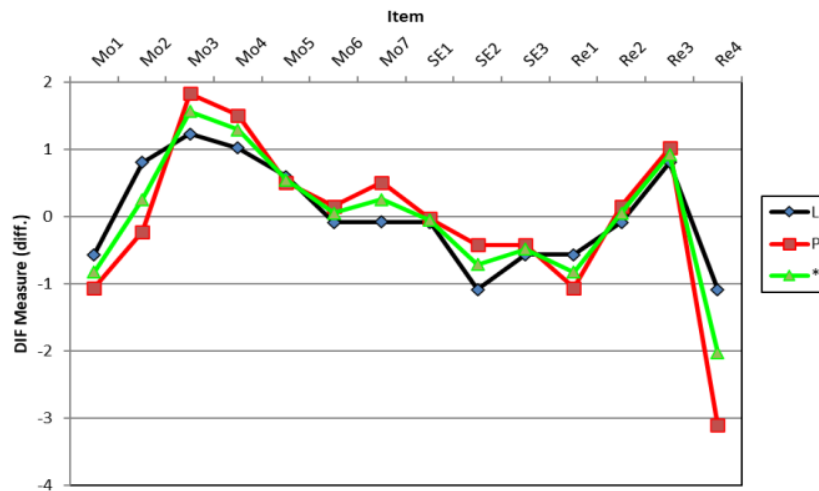
impact on increasing students' science learning outcomes.

In more detail, we look at the interaction between items and student motivation in the moderate and low groups. According to the students in these two groups, item Mo3 "The physics I study is in line with my ideals." is the most difficult item to agree on, and they do not understand the practical value of studying physics in class (Mo4). However, on the other hand, they hope that it will be helped in their future career by studying physics (Mo1).

Another thing that became an important finding was that students in the moderate and low groups found it difficult to agree on the statement on item Re3 "I studied quite hard in physics.". In fact, from the Responsibility aspect, they realize that getting good physics scores is important (Re4). So they must prepare themselves well when facing the assessment of physics lessons (Re1). From the aspect of Self-efficacy, they believe they can master the knowledge and skills in learning physics (SE3) to get good grades (SE1).

Differential Item Functioning

The trend of the items towards gender was evaluated using DIF and visualized in Figure 2. The black line (symbol L) represents the logit of Male motivation, the red line (symbol P) represents the logit of Female motivation, and the green line (symbol *) represents the average logit between the two genders.



Note: L = Male, P = Female, * = Average
 Figure 2. Differential Item Functioning motivation instrument on gender

Based on Figure 2, the 7 items on the motivational factor do not tend a certain gender. Likewise, for the Self-efficacy factor, the 3 items do not tend male or female. In the Responsibility factor, 1 out of 4 items (Re4) has a gender tendency or bias because it has a probability value of < 5% (Sumintono & Widhiarso, 2015). Item Re4 "Getting good physics scores is important to me." tend to favour female students more than boys. This can be seen from the location of the male logit, which is higher than the female logit location.

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5. CONCLUSION

Based on the results of the analysis and discussion that has been done, it can be

concluded that the average student has a high level of motivation during online learning using google incorporate. At least 43% of students have a level of motivation above the highest difficulty level. There are 19% of students have a very high level of motivation. As many as 25% of students have a high level of motivation; 41% have a moderate level of motivation, and only 16% have a low level of motivation. The DIF analysis found that item Re4 "Getting good physics scores is an important thing for me." It tends to favour one gender group.

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