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Go Formative for Formative Assessment Feedback on the 10th Graders' Material Comprehension and Learning Motivation

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ABSTRACT

Feedback on formative assessment is a teacher's effort to help students with learning difficulties by responding to their evaluation results, especially on HOTS-based evaluations, which have a higher level of completion. Therefore, this study aims to determine the effect of immediate feedback on improving Material Comprehension (MC) and Learning Motivation (LM). Unfortunately, the teacher needs to provide feedback due to several factors, one of which is time constraints due to teachers' activity. This study aims to investigate the effect of Go Formative in providing immediate feedback on formative physics assessments on material comprehension and learning motivation enhancement of 10th-grade high school students. This research is quasi-experimental with a non-equivalent control group design involving two classes, namely the control and experimental classes. The two classes were selected by employing a simple random sampling technique. This study's results show a different effect of using Go Formative in providing quick feedback in improving students' material comprehension. The existence of these differences makes the provision of quick and immediate feedback through the Go Formative website a solution to overcome the obstacles experienced by teachers in carrying out formative assessments.

INTRODUCTION

Education is closely related to learning which is composed of teaching and assessment. Teaching aims to convey information to students, and assessments are used to evaluate the results of the teaching given (Sahidu et al., 2017). Assessment should be used to check the extent to which students' comprehension level and success during the learning process. In the current learning process, teachers carry out cognitive assessments by giving tests at the end of each delivery of material. Such an assessment is called a summative assessment. Even though ideally, an assessment is carried out at the end of the material and given during the learning process. This kind of assessment is called formative assessment or assessment for learning. It aims to determine the level of comprehension of students' concepts of the material that the teacher has delivered.

There are five attributes in a formative assessment (McManus, 2008), (1) learning progression, (2) learning goals and criteria for success, (3) descriptive feedback, (4) self-assessment and peer-assessment, and (5) collaboration between teachers and students. None of the five attributes should be considered as "sine qua non," i.e., attributes without which the assessment would not be formative. It should be emphasized that the formative assessment does not require the five attributes to be present. Feedback is one form of the assessment function and aims to determine students' progress and learning difficulties (Wening, 2012). Feedback is a

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form of teacher behavior in helping students with learning difficulties by responding to the results of student evaluations.

Good quality formative assessment activities can help teachers get information about student learning weaknesses. Later the teacher has a reference in determining and providing effective feedback for students. In addition, formative assessment can also provide information to students regarding their learning progress which they will use to improve their behavior or learning methods (Ariyani et al., 2018). Kusairi (2012) also said that the higher the quality of the learning assessment, the teacher's comprehension of students' weaknesses and strengths in learning certain materials will improve. In physics learning, evaluation is also an important process. Evaluation informs what students expect in the learning process (Istiyono, 2017), which later becomes the basis for teachers to improve the learning process.

The application of formative assessment in schools has yet to be implemented optimally (Amiroh et al., 2020; Ayuningtyas et al., 2018; Okta, 2018). This is also supported by the results of a brief interview with the physics teacher SMA Negeri 1 Godean can be concluded that in every test, never give feedback to students because the time needed to analyze data and provide appropriate feedback to each student tends to be relatively long. This was also experienced in several schools such as SMA Negeri 1 Bangil, SMA Negri 3 Malang (Amiroh et al., 2020), SMA Negeri 1 Lawang (Baden et al., 2016), and SMP N 1 Pulau Panggung (Okta, 2018).

The importance of feedback for students can also close gaps and improve students' comprehension of concepts (Cruz et al., 2011; Furtak & Ruiz-primo, 2008; Saptono et al., 2013; Supardi, 2013; Tanner & Allen, 2004). Giving feedback on physics learning will further increase students' interest, enthusiasm, motivation, and learning outcomes (Ediyanto, 2016; Parimba et al., 2015). However, this research on the effect of giving feedback is still done manually (Adella et al., 2020) and takes a long time, so it is received late by students, even if it is given only in the form of a mark or grade (Yorke, 2003). These obstacles can be overcome by using a website-based online system (Ediyanto, 2016; Suyoso et al., 2017).

We must also consider the type of questions tested to support a good quality formative assessment. HOTS-based assessment is the right choice because it can measure the ability to transfer one concept to another, process and apply information, find links from different information, use the information to solve problems, and critically examine ideas and information (Widana, 2017). The provision of HOTS questions for assessment in schools has often been made in many schools. However, it still needs to be balanced with providing feedback to students due to the limitations of the previous teachers.

To overcome the limitations of providing feedback on HOTS-based questions, which usually only give final grades, teachers can solve the problem with web-based assessment. One such website is "Go Formative ."Go Formative is a website designed to provide a variety of assignments for students. Through this website, teachers can provide feedback and grades to students quickly. Go formative has several advantages, such as having many features to provide a variety of questions, create classes, monitor student work in real-time, and assessments can be done regularly without taking a long time, and without paper (Aini et al., 2018).

In addition, HOTS-based formative test questions with immediate feedback are expected to make students better understand the lessons the teacher teaches. Tomasik et al. (2018) also emphasized that computer-based formative assessment systems have easier access for teachers and students than traditional methods. Feedback provided online can be very helpful for students (Nickel, 2013) because it can be provided as soon as possible. Therefore, there is a need

for website-based media or tools such as Go Formative with the various advantages mentioned earlier. However, the website has yet to be used optimally by teachers in Indonesia. Especially, to facilitate the provision of quick feedback on HOTS-based assessments, so that students can be motivated to improve their learning process.

Previous research on formative assessment has been widely carried out as formative assessment plays a role in student motivation (Leenknecht et al., 2021), students' self-regulated (Granberg et al., 2021; Xiao & Yang, 2019), its effectiveness (McCallum & Milner, 2021). Media use as a formative assessment platform has also been extensively developed in previous studies, such as gamified e-quizzes (Zainuddin et al., 2020) and Kahoot! (Ismail et al., 2019; Kalleny, 2020), Moodle quiz (Fernando, 2020); Quizziz (Matlan & Maat, 2021). Based on the explanation above, a HOTS-based formative assessment has yet to be implemented. Therefore, this research raises the basis of HOTS. This study aims to determine the effect of giving feedback through Go Formative on the quality of students in terms of Material Comprehension Enhancement (MCE) and Learning Motivation Enhancement (LME).

METHODS

This research is a quasi-experimental research with a non-equivalent control group design. This research was conducted at SMA N 1 Godean using two classes, namely experimental and control classes. The experimental class was given feedback through Go Formative, while the control class was given feedback conventionally through paper. Both classes were given lessons with the discovery learning model and given 22 items of formative questions.

Table 1. Non-Equivalent Control Group Design

Class	Pretest	Treatment	Posttest
Experiment	Y_1	X_1	Y_2
Control	Y_1	X_2	Y_2

The research sample was taken by cluster random sampling consisting of two classes: the experimental and the control groups. The number of samples used as research subjects in this study amounted to 50 people.

This research begins with preparing instruments consisting of learning devices, HOTS-based physics formative test questions on the material "Work and Energy," and motivation questionnaires. All instruments were validated by experts consisting of lecturers and teachers. Feasible instruments are used to collect MC and LM data. In the data collection process, feedback was also given in each quiz.

The first quiz is a pretest, and the next quiz is a posttest to determine the increase in mastery of the material after being given feedback. Questionnaires are used to determine students' learning motivation toward physics lessons before and after being given treatment by giving feedback.

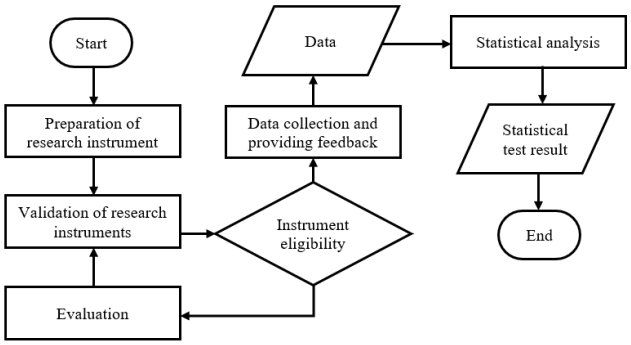

Figure 1. Research Flowchart

The data obtained were then subjected to statistical analysis to determine the MCE and LME (see Fig. 1). The statistical analysis used the prerequisite hypothesis test and the Manova test with General Linear Model (GLM) - Multivariate analysis. The decision-making in this test is that H_0 is rejected if Sig. <0.05. and H_0 is accepted if Sig.> 0.05. The hypothesis proposed in this study is as follows.

H_{01}: There is no difference in the effect of giving feedback through Go Formative on students' MCE.

H_{11}: There is a difference in the effect of giving feedback through Go Formative on students' MCE.

H_{02}: There is no difference in the effect of giving feedback through Go Formative on students' LME.

H_{12}: There is a difference in the effect of giving feedback through Go Formative on students' LME.

RESULTS AND DISCUSSION

Instrument Validation Results

To support the research, lesson plans are needed. Overall, the lesson plans for both control and experimental classes have been validated, passed the validity test with good criteria, and are suitable for use in research.

The developed question items have also been validated and revised according to the validator's suggestions so that they can be tested. The content validity of the question items was analyzed using V Aiken; overall, the formative test questions passed the content validity test because they were classified as "Very High" (more than 0.8).

17 11th-grade students empirically tested the 40-item formative test questions. After empirical testing, the data obtained were analyzed using the Quest program. Setyawarno (2017) said the item fits the model if the INFIT MNSQ value is between 0.77 and 1.30. There were 22 items accepted out of 40 items tested (see Figure 2).

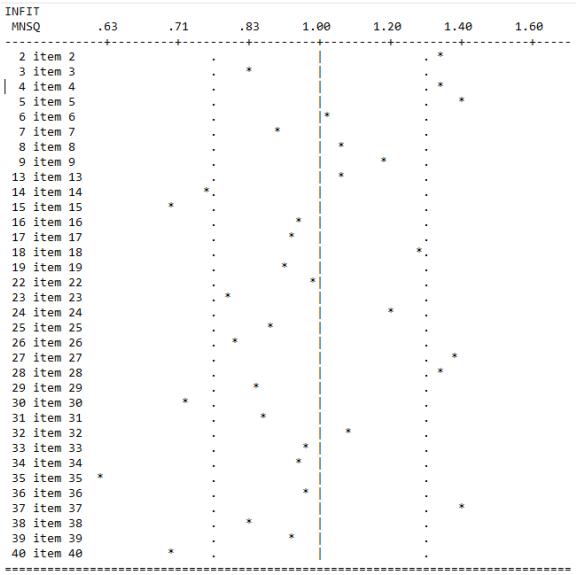

Figure 2. MNSQ Infit Distribution

Statistical Analyze Result

The first interpretation based on the GLM-Multivariate results is to see the Box's M Test table. The table tests Manova's assumption, namely the homogeneity of the variance-covariance matrix. That is, the two dependent variables are calculated together for the homogeneity of the variance-covariance. The hypothesis for this test is:

H_0 : Variance-covariance matrix between MCE and LME is homogeneous

H_1 : Variance-covariance matrix between MCE and LME is heterogeneous

The results of Manova's assumptions based on MCE and LME can be seen in Table 1. To fulfill Manova's assumptions, H_0 will be accepted if the Sig.> 0.05. Based on the table above, the Sig. At 0.452, then H_0 is accepted.

Table 1. Box's Test of Equality of Covariance Matrices

Box's M	2.755
F	.877
df1	3
df2	414720.000
Sig.	.452

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.
a. Design: Intercept + Feedback

The multivariate table interpretation describes four significance tests for each feedback effect. This can be seen in Table 2 Sig value. On the feedback line, all of them showed a value of 0.001 (Sig <0.05). This shows that giving feedback using Go Formative and conventionally is significantly different on MCE and LME of students. There are differences between MCE and LME for students who get feedback through Go Formative and conventional.

Table 2. Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.011	.259[b]	2.000	47.000	.773
	Wilks' Lambda	.989	.259[b]	2.000	47.000	.773
	Hotelling's Trace	.011	.259[b]	2.000	47.000	.773
	Roy's Largest Root	.011	.259[b]	2.000	47.000	.773
Feedback	Pillai's Trace	.254	7.989[b]	2.000	47.000	.001
	Wilks' Lambda	.746	7.989[b]	2.000	47.000	.001
	Hotelling's Trace	.340	7.989[b]	2.000	47.000	.001
	Roy's Largest Root	.340	7.989[b]	2.000	47.000	.001
a. Design: Intercept + UB						
b. Exact statistic						

To determine the influence of factors (variable giving feedback through Go Formative and conventional) can be seen in Table 3. This table shows the effect of giving feedback on MCE and LME of students separately.

In the Sig. feedback line, the value of Sig. MCE is 0.001, and Sig. LME is 0.115. The significance value of LME is more than 0.05 (Sig> 0.05), so that H_0 is accepted, it can be concluded that separately giving feedback through Go Formative and Conventional is proven to produce achievements that are not too different. In other words, there is no difference in the effect of providing feedback in two ways on students' LME.

The Sig MCE value is less than 0.05 (Sig. <0.05), so H_0 is rejected. It can be concluded that separately providing feedback through Go Formative and conventionally proven to produce different achievements in students' MCE.

Table 3. Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	MCE	499.280[a]	1	499.280	12.365	.001
	LME	436.424[b]	1	436.424	2.575	.115
Intercept	MCE	13.520	1	13.520	.335	.566
	LME	23.999	1	23.999	.142	.708
Feedback	MCE	499.280	1	499.280	12.365	.001
	LME	436.424	1	436.424	2.575	.115
Error	MCE	1938.200	48	40.379		
	LME	8134.640	48	169.472		
Total	MCE	2451.000	50			
	LME	8595.062	50			
Corrected Total	MCE	2437.480	49			
	LME	8571.064	49			
a. R Squared = .205 (Adjusted R Squared = .188)						
b. R Squared = .316 (Adjusted R Squared = .302)						

Hypothesis test results show that the significance of MCE is less than 0.05 (Sig.<0.05), so H_{01} is rejected. There is a difference in the effect of providing feedback through the Go Formative website on increasing students' mastery of the material. These results align with Febriyanti (2013), where there is a significant effect on the form of the feedback given on trigonometry learning outcomes.

Hypothesis test results (shown in Table 6.) show that the significance of LME is more than 0.05 (Sig.> 0.05), so H_{02} is accepted. There is no difference in the effect of giving feedback through Go Formative on LME due to several factors.

Analyze Material Comprehension Enhancement (MCE)

Data on students' MCE were obtained through the first, second, and third quizzes. Based on the data obtained, the average value of the quiz and the average gain of each gain between the quizzes is obtained. MCE was obtained from the average gain. The analysis table for material comprehension enhancement can be seen in Table 4.

Table 4. Analyze of MCE

Class	MC	Average Value	Gain 1	Gain 2	Average Gain
Control	Quiz 1	82,44	-16,36	11,08	-2,64
	Quiz 2	66,08			
	Quiz 3	77,16			
Experiment	Quiz 1	86,71	1,42	6,25	3,83
	Quiz 2	88,13			
	Quiz 3	94,36			

Based on the average MC values of the experimental and control classes in Table 4, giving feedback through Go Formative is more influential than giving feedback through conventional means

because students get encouragement and reinforcement from the feedback given quickly. Feedback is given a day after the evaluation when students are still enthusiastic about the correctness of their answers. Formative assessment affects student achievement between 0.4 and 0.7 in children aged five years to university

(Ardiansyah et al., 2018; Black & Wiliam, 1998). Hattie (2009) also reported that formative assessment impacts student achievement with an effect size of 0.9. formative assessment is ranked third out of 138 learning activities that affect student achievement.

This statement is also supported by the principle of using feedback (Brown et al., 1997; Haryoko, 2011; Hatziapostolou & Paraskakis, 2010); namely that feedback is given as soon as possible or timely by the teacher to students since students can still recall how they addressed each assessed task. They can immediately find out their strengths and weaknesses in mastering the material after receiving feedback from the teacher (Race, 2006).

The control class was given feedback with a time lag of four days after the quiz was carried out because the teacher needed time to correct and write feedback conventionally. The experimental class was given feedback within one day of the quiz because the feedback had been made and only had to send it. Quizzes through Go Formative are no longer required to correct answers because the system automatically does them. The feedback contains corrected feedback where if the students' answers have deficiencies or errors, the teacher corrects the answers and shows the right answers associated with the material concept.

The comparison of the average value of the student's MC between the experimental and control class can be seen in Figure 3. The average MC obtained for the experimental class in the second week increased to 88.13. The control class has decreased to 66.08. This increase is due to providing immediate feedback in a short time through Go Formative, making students know more quickly the strengths and weaknesses in mastering the material being taught, thus providing reinforcement and encouragement (Seruni & Hikmah, 2014) for students to correct errors on the test.

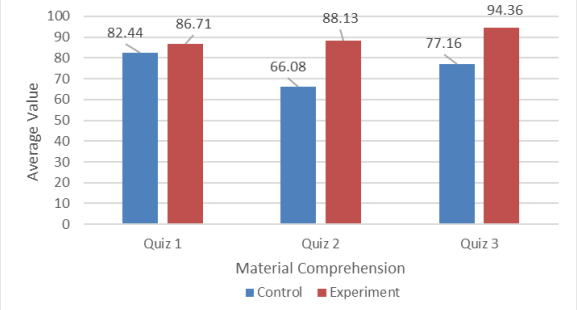

Figure 3. Average MC of Experiment Class and Control Class Students

This increase occurred as a form of application of formative assessment in learning (Irons, 2008). (Cruz et al., 2011) MCE occurs because of the feedback provided by the teacher quickly and precisely through formative assessments. However, the control class has decreased because the role of feedback previously given could be more influential due to a long-time lag. This long-time lag makes students not eager to correct wrong answers. Even though corrected feedback has been given, students still need to remember the material from the questions in the previous quiz, so they will encounter difficulties and instead choose to forget them.

In the last week of the control and experimental classes, the increase in the material's mastery value became 77.16 and 94.36. The experimental class shows more continuous mastery of the material than the control class, which tends to fluctuate because the experimental class has taken advantage of earlier feedback provided by the teacher through Go Formative as a means of self-improvement. The control class uses the second feedback to make self-improvement in the learning process so that the material mastery value is better than before.

Giving feedback in a short time can improve classroom management and student performance (Dihoff et al., 2010). Providing immediate or direct feedback is more effective (Haryoko, 2011) than giving delayed feedback.

The experimental class's average MCE is 3.83, while the control class is -2.64. This finding shows that the feedback given is fast and continuously able to improve material comprehension of physics. The feedback that is carried out continuously can improve conceptual comprehension (Shute, 2008). The experimental class students, by providing fast feedback through Go Formative, provided more reinforcement and encouragement to correct mistakes in studying the material compared to the control class.

The Analysis of Learning Motivation Enhancement (LME)

Data on students' LME were obtained through a student motivation questionnaire that had been developed. Then the researchers obtained the value of initial motivation, final motivation, and gain of student motivation. The LME obtained from the gain can be seen in Table 5.

Table 5. LME Analysis

Class	LM	Average value	Gain
Control	Before	76,99	-2,26
	After	74,73	
Experiment	Before	72,04	3,65
	After	75,69	

First, the feedback form contains the same content between the experimental and control classes, even though it is given at different times. Providing direct and delayed feedback motivates students (Haryoko, 2011) to learn and build positive learning attitudes.

Second, feedback is given by the teacher, which results in students immediately accepting it without clarifying or discussing it again with the teacher. Students' learning motivation will be higher if they get feedback from peers than teachers (Mertasari, 2014). Psychologically, students will be more straightforward, open, and courageous in asking for clarification from their peers than teachers. When students receive feedback from peers, they will communicate effectively. They can discuss to get an agreement about the truth or error in the answers to the questions. This condition will increase self-confidence and ultimately increase motivation to learn.

Third, some students need to pay more attention to the feedback provided. Juwah et al. (2004) suggest that students' acceptance of feedback is also a very important factor. For students with a positive mindset, seeing and reading feedback can be used as an opportunity for further self-development. On the other hand, students who have a negative attitude may be discouraged or even ignore it (Yorke, 2003).

Apart from these factors, another cause was the motivation questionnaire containing intrinsic motivation items. The treatment carried out was in the form of irrelevant treatment, namely providing feedback containing sentences of appreciation, motivation, and answer justification. The likelihood of learners being intrinsically motivated by external treatment is very small. It makes the learning motivation score between the two classes the same. Even the increase in motivation in the control class is lower than in the experimental class.

The comparison of students' average LME results between the control and experimental class can be seen in Figure 4.

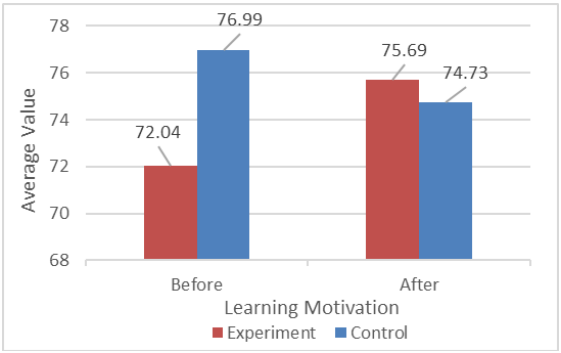

Figure 4. Average LM of Experiment Class and Control Class

This difference occurred because the experimental class was given feedback through Go Formative with an interval of one day. Giving quick feedback through this website increases students' motivation because the enthusiasm for learning and

students' curiosity about their work results is still high. The height of these two things makes the feedback given the day after the quiz more acceptable so that students quickly realize where their mistakes are and are motivated to immediately improve the learning process. According to Juwah et al. (2004), students' motivation and self-esteem can be affected by feedback. The impact of feedback can be positive or negative. It can affect students' personal feelings, which in turn affects their engagement in the learning process. Therefore, feedback should be reinforcing and constructive to help students' motivation and encouragement.

The feedback given contains motivational sentences and appreciation sentences. Meaningful feedback such as rewards for learning outcomes, in the form of constructive criticism of LM, and process improvement or achievement of learning outcomes, can develop self-confidence and increase student motivation (Haryoko, 2011). Feedback makes students more active and more thorough and increases their motivation to learn (Sappaile, 2014) due to the results of the tests that are returned containing important comments or notes from the teacher.

However, the control class experienced a decrease in LM. The feedback from the paper answer sheet did not increase their LM entirely. Giving delayed feedback will not motivate because, over a long period, students need to remember the questions they are working on (Sutawan et al., 2014). The length of time giving feedback has decreased enthusiasm for learning and their curiosity about the correctness of their answers. The feedback given through this paper answer sheet is also easily ignored by students so the motivation to improve the learning process and take physics lessons decreases. Overall, providing immediate feedback on formative assessment can be more optimal in improving MC. Providing this feedback will be more optimal if it is through a formative test learning platform such as the Go Formative website.

CONCLUSION AND SUGGESTION

There is no difference in the effect of using the Go Formative in giving feedback on increasing student motivation. There are differences in the effect of using Go Formative to provide feedback on students' material comprehension enhancement. Giving feedback through Go Formative has more effect on students' material comprehension enhancement than conventional giving.

AUTHOR CONTRIBUTIONS

ZD: Concept and design, technical support, data acquisition, data analysis, drafting the manuscript. EI: Data analysis, supervision, final approval.

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