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The effect of using teacher feedback on concept mastery and students' self-assessment of the essay test on monohybrid and dihybrid cross topic

Allyany Hasyaty*, Siti Sriyati, Amprasto

Department of Biology Education FPMIPA Indonesian Education University, Dr. Setiabudhi Street, No. 229 Bandung

*Corresponding author: allyanyhasaty@upi.edu



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ABSTRACT

This study aims to identify the effect of using teacher feedback on students' concept mastery and self-assessment on the topic of monohybrid and dihybrid crosses. The method used in this research was a quantitative quasi-experiment with Nonequivalent Control Group research design. The participants in this study were among 69 ninth grade students (33 control class students and 36 experimental class students) at one of the public junior high schools in Bandung Regency. This study uses positive written feedback with the types of supporting, direct corrective and guidance on students' essay test answer sheets. To measure students' mastery of concepts, an essay test was used with a total of 10 questions. To measure students' self-assessment, a 1-4 Likert scale questionnaire was used using indicators that were adjusted to the indicators on the essay questions. The results showed that there is a significant difference in students' concept mastery and students' self-assessment ability in the control class and experimental class. As for the N-Gain test, the category of concept mastery improvement in the control class belongs to the low criteria (0.19) and the experimental class belongs to the medium criteria (0.57). Students' self-assessment skills in the control class (60%) and experimental class (70%) are classified in the sufficient and good categories. Students' responses to the teacher's feedback showed a positive response. Based on this research, the use of teacher feedback on essay tests affects students' concept mastery and self-assessment.



INTRODUCTION

In learning activities, it is not uncommon for teachers to give tests in the form of essay questions (descriptions). The researcher mentions in the research by Javaeed (2018) states that essay-type assessment is a sensitive test requiring students not only to recall facts but also to use higher-order cognitive skills. This results in students often having difficulty in solving essay questions and found that most students find it difficult to answer essay questions.

One of the efforts in overcoming learning difficulties is to provide assistance to students, which can be in the form of providing feedback to students. Feedback is used by teachers as a basis for improving the learning process, facilitating students about what they need to learn, providing opportunities for students to learn, and providing students with practice in solving a problem (Jurs & Spehte, 2021). According to Gentrup et al. (2020), feedback has been empirically identified as being among the most important instructional practices for provides useful information about how well a student is performing. Frequent and informative teacher feedback therefore helps students to overcome mistakes and improve their skills.

In addition, to improve students' concept mastery, a self-assessment questionnaire can also be given. Self-assessment is a process in which students assess their own learning so that they can identify their weaknesses and strengths in the learning process (Syafitri et al., 2020). Self-assessment is often defined as a personal reflection directed at one's own performance to determine the individual ability of one's level of knowledge, skills, and understanding in a particular field (Andrade, 2019). According to Lesmana & Rokhyati (2020), with self-assessment, can help students increase their motivation during the learning process. Despite the importance of self-assessment, students still have difficulty accurately assessing their own work. Therefore, with teacher feedback, in addition to helping students with learning difficulties, it can also support student self-assessment, because students can compare their answers with the correct answers and students can make a more accurate assessment of the learning that has been done. When students are given the correct answers to assess their own learning, the accuracy of students' self-assessment has been shown to increase (Baars et al., 2014; Raaijmakers et al., 2019; Snead & Freiberg, 2019). In addition, according to Syafitri et al. (2020) when students know which concepts are right and wrong, students are able to assess themselves correctly.

In terms of the genetics process, it is also composed of many complicated processes such as mitosis, meiosis, monohybrid, and dihybrid crossing, and so on. The concept of genetics consists of various sub concepts that each have different characteristics (Elvianasti, 2018). Students tend to find it difficult to understand abstract concepts such as the size of cells, molecules, and atoms in relation to each other as well as distinguishing between the various time scales on which each of these levels function (Jenkinson, 2018). The importance of learning the topic of genetics is because this topic is related to aspects of life that play an important role in the inheritance of traits, namely how traits in living things can be formed and also how these traits can be passed on to their offspring. Machova & Ehler (2023) stated that the topic of genetics is abstract. Genetics was stated as one of the most complicated topics for students by 70% of all teachers. Prochazkova et al. (2019) added that experience shows that especially medical molecular genetics, genomics, and bioinformatics are considered difficult by many students. Based on research by Jenkinson (2018) genetics is one of the difficult lessons. Students have learning difficulties in genetics subtopics such as: crosses, genetic terms, mitosis and meiosis, codominance, sex determination, mutation, and variation because the topic is abstract and complicated. Therefore, monohybrid and dihybrid topics were selected. Based on the description above, the author is interested in conducting a study that aims to identify the effect of using teacher feedback on student mastery and self-assessment on essay tests on monohybrid and dihybrid crosses.

METHODS

The methods used in this research are quasi-experimental research with nonequivalent control group design. The population in this study were all grade XI students at one of the public junior high schools in Bandung Regency which was determined by convenience sampling technique. The technique was chosen because it was adjusted to school policy so that the determination of the sample was determined by the school.

The instrument used in this study is an essay question used to measure students' mastery of concepts. In the question, there are 3 indicators based on Bloom's Revised Taxonomy, which are C2 (understanding), C3 (applying), and C4 (analyzing) that are distributed into 10 questions. After students' finish working on the essay tests, the results are corrected by the teacher and given feedback in the form of positive writing with the types of supporting, direct corrective, and guidance. Meanwhile, a 1-4 Likert scale questionnaire is used to measure students' self-assessment related to their mastery of concepts so that the indicators in this questionnaire are adjusted based on the indicators of essay questions, a questionnaire with "Yes" and "No" answer options is used to find out students' responses to the feedback provided.

Data analysis of research results from essay tests and self-assessment questionnaires was carried out using an inferential statistical approach, which was previously tested for normality and homogeneity first. If the data is normally distributed (Sig. <0.05) then proceed with the parametric statistical test, which is the unpaired sample t-test, meanwhile if one of the datas is not normally distributed (Sig. >0.05) then a non-parametric statistical test is carried out, in this case the Mann-Whitney test, where there is a significant difference if Sig. < α with α of 0.05. Furthermore, the N-Gain test was conducted on student test results. Calculations on the self-assessment questionnaire were conducted to determine the students' self-assessment criteria, then calculations were also carried out on the student response questionnaire to find out the students' views on the feedback that had been given.

RESULTS AND DISCUSSION

The effect of teacher feedback on student concept mastery

After conducting Test 1 and Test 2, the following data are presented in Table 1.

Table 1. Recapitulation of test 1 and test 2 data analysis results

Data	Test 1		Test 2	
	Control	Experiment	Control	Experiment
N	33	36	33	36
Average	19,94	25,28	35,03	66,78
Normality Test (Kolmogorov-Smirnov)				
Components	Test 1		Test 2	
α	0,05		0,05	
Sig.	0,011		0,090	
Criteria	Sig < α		Sig < α	
Conclusion	Data not normally distributed		Normally distributed	
Homogeneity Test (Levene)				
α	0,05		0,05	
Sig.	0,086		0,001	
Criteria	Sig > α		Sig > α	
Conclusion	Homogenous		Not homogenous	
Hypothesis Test (Mann-Whitney)				
α	0,05		0,05	

Sig.	0,159	0,000
Criteria	Sig > α	Sig < α
Conclusion	There are no differences	There are differences
N-Gain		
	Control	Experiment
N-Gain Score	0,21	0,57
Categories	Low	Medium

In Table 1 based on the Mann-Whitney test that has been conducted, it is found that the sig value. (2-tailed) in the 1st test is $0.159 > 0.05$ which means that the value accepts H_0 indicating that there is no difference in the average mastery of student concepts in the experimental and control classes. Furthermore, based on the Mann-Whitney test conducted on the 2nd test, the sig. (2-tailed) of $0.000 < 0.05$, which means that the value rejects H_0 , indicating that there is a difference in the average mastery of students' concepts in the experimental and control classes. In other words, the treatment in the form of giving feedback on the results of the essay test has an effect on students' mastery of concepts. As for the results of the N-Gain test, it is known that the category of concept mastery improvement in control class students belongs to the low category while the category of concept mastery improvement in experimental class students belongs to the medium category. The treatment given in the study in the form of providing feedback can improve students' mastery of concepts regarding the topic of monohybrid and dihybrid crosses. In addition, concept mastery before being given the same treatment is in the low category while after being given the treatment there is an increase. The experimental class is classified into the good category while the control class is still classified into the poor category.

Based on research conducted by Abdurrahman et al. (2018) indicate that the feedback process in ongoing assessment with soft scaffolding was able to improve students' learning performance significantly. Feedback activity encourages students to be more motivated and improving cognitive process, facilitating information processing, and transforming knowledge presented in the learning process. The application of feedback on students' LKS (worksheet) assignments can improve students' mastery of concepts as seen from the increase in LKS (worksheet) scores that increase at each meeting (Abdurrahman et al., 2018). Students accept feedback as something that can foster motivation, increase the desire to learn and improve learning outcomes, namely concept mastery. Students accept feedback as something that can boost motivation, increase the desire to learn and improve learning outcomes, especially concept mastery. The use of written feedback in learning will train students to find out mistakes from the corrections given by the teacher so that it makes students' minds open again.

The effect of teacher feedback on student self-assessment

Data collection regarding the effect of the use of teacher feedback on student self-assessment was carried out using a 1-4 scale Likert questionnaire instrument with a total of 14 statements. The following data presents the results of student self-assessment in Table 2.

Table 2. Recapitulation of self-assessment data analysis results

Data	Control	Experiment
N	33	36
Average	60,82	79,33
Normality Test (Kolmogorov-smirnov)		
α	0,05	0,05
Sig.	0,371	0,011
Criteria	Sig < α	Sig < α
Conclusion	Data not normally distributed	Normally distributed

Homogeneity Test (Levene)		
α		0,05
Sig.		0,006
Criteria		Sig > α
Conclusion		Not Homogenous
Hypothesis Test (Mann-Whitney)		
α		0,05
Sig.		0,005
Criteria		Sig < α
Conclusion		There is difference
Self-Assessment Category		
Average	60,22	70,33
Category	Sufficient	Good

In Table 2 based on the Mann-Whitney test that has been carried out, it is found that the sig value. (2-tailed) of $0.005 < 0.05$ which means that the value rejects H_0 which indicates that there is a difference in the average self-assessment of students in the experimental and control classes. Giving feedback on self-assessment affects students' self-assessment in mastering the concept of monohybrid and dihybrid material. Giving feedback on self-assessment affects student self-assessment in mastering the concept of monohybrid and dihybrid topics. Based on the categorization, it was found that students' self-assessment in the control class was classified in the sufficient category, which means that students assessed themselves as sufficiently mastering the concept of monohybrid and dihybrid crossing topics, while in the experimental class it was classified in the good category, which means that students assessed themselves as good in mastering the concept of monohybrid and dihybrid crossing topics. In other words, the treatment in the form of providing feedback on essay test results affects student self-assessment. The results of research conducted by Peloghitis (2019) show that feedback has an important role in the self-assessment process. The results show that students in the lower middle category can make assessments based on their work if given feedback, because the results show that students are able to make self-assessments based on their work if given feedback. According to Abdurrahman et al. (2018) mastering concept in understanding the subject because feedback improving motivation and creativity. Feedback is known as something that has the potential to generate motivation, help students increase learning and improve their ability to do tasks, and can help students be more reflective or conduct self-assessment and clearly know their learning achievements and progress (Guo & Wei, 2019; Narciss et al., 2014; Wisniewski et al., 2020).

The category of self-assessment in the control class is sufficient which is not in accordance with the category of concept mastery test results which is classified in the category for less, while self-assessment in the experimental class is classified in the good category and in accordance with the category of concept mastery results. The discrepancy in assessment in the control class can be caused by several factors, such as (a) students are overconfident so they rate themselves high and (b) students do not know where their mistakes are in taking the test so they rate themselves as mastering the concept. Therefore, the role of feedback affects student self-assessment because students who are given feedback are able to assess themselves correctly. Students in the control class were only given answer sheets that had been checked without being given feedback on their answers so that students did not know where their mistakes were. According to Syafitri et al. (2020) when students know which concepts are right and wrong, students are able to assess themselves correctly. Feedback and self-assessment also help students in self-regulating while learning (Vasu et al., 2022).

Students' response to teacher feedback

Data collection regarding student responses was carried out using a questionnaire with the answers "Yes" and "No" with a total of 12 statements spread into 4 indicators, which are interest, benefits, content and use. The following presents the results of the calculation of the student response questionnaire shown in Figure 1.

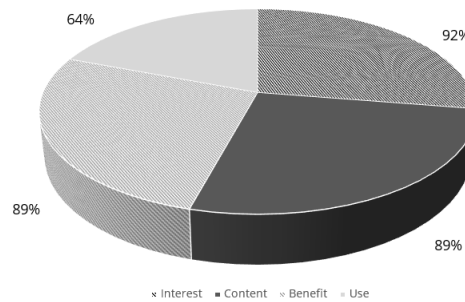


Figure 1. Percentage of student response to feedback based on indicators

Based on the diagram above, it can be seen that the highest score calculation on the interest indicator with a percentage of 92% is interpreted that almost all students answered "Yes" indicating that students are very happy to get feedback on their essay test results. Based on the content indicator with a percentage of 89%, it is interpreted that almost all students answered "Yes", indicating that the content of the feedback given was clear and easy for students to understand. Furthermore, in the third indicator, which is the benefit with a percentage of 89%, it is interpreted that almost all students answered "Yes", indicating that providing feedback is beneficial for students.

The benefits obtained by students include students being able to find answers that are not correct, students are able to know what they need to learn further, students are able to assess their mastery of concepts, students are able to know what concepts they have understood and concepts they have not understood, finally students become easier to take the second test after being given feedback. This indicates that the feedback given by the teacher helps students in their learning. The last indicator regarding the use of feedback with a percentage answer of 64% interpreted that most students answered "Yes". Students use feedback to review answers on test results and also for reference to relearn topics that they have not mastered. The same thing was stated in the study of Vasu et al. (2016), where most students felt that feedback from teachers could help them. Based on this explanation, it can be concluded that the provision of feedback on the test results received a positive response from almost all students. As for some of the limitations of this study that can be anticipated by future researchers, self-assessment should be complemented with peer assessment and performance observation results, then the lack of elaboration of results and discussion, the need for deepening the research results and the process of triangulating the main information from several data sources.

CONCLUSION

Overall, the use of teacher feedback can help improve students' concept mastery and self-assessment. This is evidenced by the average difference between the 1st and 2nd test scores in the control and experimental classes, then the average difference between students' self-assessment of the concept of monohybrid and dihybrid crossing topic matter they mastered. As for the category of concept mastery improvement in the control class belongs to the low category while in the experimental class belongs to the medium category. Then the self-assessment of

students in the control class is classified in the sufficient category and in the experimental class is classified in the good category. The students' responses to the teacher's feedback showed a positive response.

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Authors' Note

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