THE EFFECTS OF FORMATIVE FEEDBACK ON STUDENT LEARNING IN SCIENCE EDUCATION

Michael Schultz Naperville Central High School Naperville, Illinois July 2019

Background

As educators, we are always striving to improve our practice. One area that I have focused on in recent years is formative assessments. In an effort to increase the effectiveness of these assessments for student learning, I have increased the quality of feedback that is provided to students.

When learning something new, the feedback students are provided with helps to shape their understanding. Reflecting on this concept when students complete an assessment, feedback should be specific to the individual student's learning and elicit students to think about their answers. This is a change from the traditional evaluative feedback that simply confirms the correct answer or incorrect answer with a check mark or slash. Students should also generate their own specific feedback on formative assessments to self-assess and advance their learning.

The purpose of this research was to demonstrate how different models of feedback impact student performance on summative assessments.

Treatment

Different feedback methods were implemented for three consecutive units in a high school biology course.

- Baseline: Students received only evaluative feedback from the teacher such as error-flagging.
- Treatment One: Students received detailed feedback from the teacher that includes descriptive responses to student answers.
- Treatment Two: Students generated detailed feedback as the assessment is reviewed during class.

Research Questions

<u>Primary Question:</u>

- How does the feedback method on formative assessments affect student learning?

<u>Sub-Questions:</u>

- How do different feedback methods on formative assessments impact student engagement?
- How do different feedback methods on formative assessments impact student motivation?
- What methods of creating detailed feedback on formative assessments are most time effective for teachers?

Data Analysis

Data was collected for two sophomore biology classes. Second hour is a co-taught class with a special education instructor.

Table One:
Classroom Demographics

	Number of Students					
Class Period	Total	Male	Female	504	IEP	Low-Income
Semester One; Period Two	22	10	12	0	7	3
Semester One; Period Six	23	8	15	3	0	1
Semester One; Period Two	20	8	12	0	6	2
Semester One; Period Six	23	8	15	3	2	1

Note. (Semester One: *N*=45; Semester Two: *N*=43)

<u>Student Performance</u>

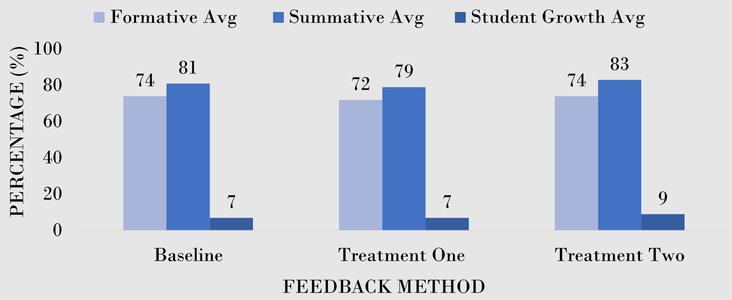

Figure One
Student Growth Per Treatment Method
(Baseline: *N*=45, Treatment One: *N*= 45, Treatment Two: *N*=43)

<u>Student Surveys</u>

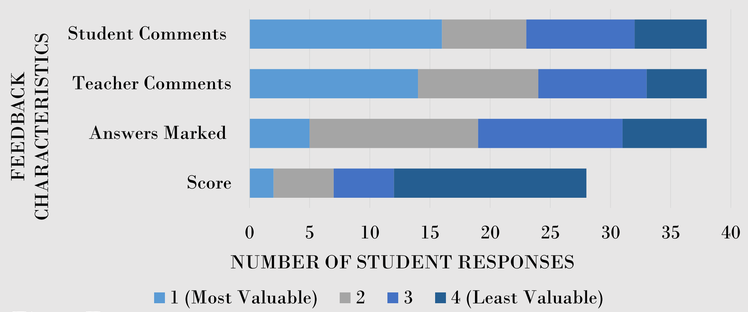

Figure Two
Student Value of Different Characteristics of Feedback (*N=38*)

Student Opinion

<u>Student Quotes on Teacher Generated Feedback:</u>

- "I prefer teacher feedback because I like to see an explanation of where I went wrong and how to fix any errors to help me study."
- "The teacher feedback is not personalized because the teacher does not know how you learn individually."

<u>Student Quotes on Student Generated Feedback:</u>

- "By writing my own feedback it helps me to easily go back and look at the red writing to remember what mistake or things I thought were important for the summative assessment."
- "I can word answers that I got in my words instead of words I wouldn't use or remember. I like seeing how I did on assessments right after too."

Conclusion

From this research, several patterns emerged about feedback. The central pattern is that students benefit the most from descriptive feedback.

Although the second treatment demonstrated the greatest student growth, the quantitative data does not show a statistically significant difference between the methods. This could be linked to the difficulty and timing of the individual units.

From student surveys and interviews, detailed feedback is the most valuable aspect of feedback because it helps to modify and improve learning. Students need to be an integral part of this process to make the feedback more meaningful. One effective method to do this is to have students generate their own personalized feedback. This increases engagement and provides a path for student success, which can increase a student's motivation. Student-generated feedback also provides immediate feedback and decreases the work time for the teacher.

Value and Future Work

This project has impacted my pedagogical practices in several ways. I have improved the quality and value of formative assessments in my classroom that will directly impact student learning. I have also enhanced my data analysis skills that have been the foundation of differentiated instruction within my classroom.

From this research, it is best practice to use a variety of methods to provide students detailed feedback to stimulate student engagement. I have created several new ways to make students an integral part of this feedback loop. The next steps in this field of educational research may include analyzing the relationship between some of these different methods and student learning.