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# Formative Assessment and the Impact on Student Learning

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### Abstract

The objective of this action research project was to examine the impact that formative assessment has on student learning. These formative assessment techniques were used in a general education environment with eighty-nine students. Data collection took place over the course of a three-month time period with both quantitative and qualitative techniques. These techniques were summative assessment scores as well as a student survey. Analysis of the overall data shows that formative assessment methods that are used in the classroom positively impacts student learning.

### Formative Assessment and the Impact on Student Learning

One of the greatest undertakings that teachers participate in with students is helping to ensure students understand and learn the content being covered. Call it part of the job, responsibility, obligation or duty, but teachers play a major part in ensuring students leave the classroom with a knowledge of what has been covered so that students can continue an education to ultimately contribute to society in the vocation of their calling, for the glory of God. Teachers over the generations have used different methods, styles, and processes in the education of students to get the most out of students with the different abilities that each one possesses. While education has changed dramatically over the years, there are practices that have been proven to reach the highest levels of student academic achievement.

Formative assessment is a powerful way that teachers can help in this endeavor. It is a way to gauge what students know versus what is unknown. Traditionally, the typical way that teachers and students have been informed of the learning that has taken place was through summative assessment, a test that is given at the end of a chapter or a unit to measure what students understand and know from the instruction that has taken place. Grades are generally given out to students, depending on how well the student did on these tests, and then teachers and students alike move on to the next phase of the curriculum. Formative assessment is altogether different in that it, “gives teachers information that they can use to inform their teaching and improve student learning while it is in progress and while the outcome of the race can still be influenced” (Greenstein, 2010, p. 2).

As a middle school teacher for the last 14 years, the hope is to gain insight on how impactful formative assessment is on student learning. The use of formative assessment will be used to help pinpoint and address any impediments that student’s show in the learning, while the

outcome of what is learned can still be determined. The hypothesis is that students will make greater gains in overall knowledge of the content with the use of formative assessment.

### **Literature Review**

There is no doubt that educators throughout history have used means and methods in the process of teaching students. Teachers have used these practices to ascertain whether students have properly gained knowledge of any given material. However, Michael Scriven coined the term formative assessment in 1967. Scriven (1967) wrote about an evaluation process for the goal of improvement and called this process formative. The formative process explains that, “while a program is in the planning and developmental stages, it is still malleable, and the information gathered from evaluation can therefore contribute to change in the program” (Greenstein, 2010, p. 20). From this time on, the term formative assessment has been used in educational settings as a way to inform teachers on student learning while the learning is taking place. With the use of formative assessment practices, teachers have been able to use information that has been gathered to make the necessary adjustments and changes with the hope that students would master content.

In the book written by Douglas Fisher and Nancy Frey (2014), the two authors explore both common formative assessment techniques in the classroom as well as the importance of such techniques for student learning. These two authors argue that while most classroom teachers check for student understanding with questions such as, “Did you all get that?” or “Does that make sense?” These methods are insufficient when trying to assess whether or not students actually reach the level of learning that is needed (Fisher & Frey, 2014). The organized work of this book was put into categories such as, “oral language, questioning, writing, projects and performances, tests, and school wide approaches” (Fisher & Frey, 2014, p. 1-2). Furthermore,

Fisher and Frey (2014) lay a foundation in which a teacher understands the importance of establishing a comprehensive formative assessment system. This system has three parts that involve learning goals, student feedback, and the planning of student instruction based on identified weaknesses or errors. Fisher and Frey (2014) contend that when a comprehensive formative assessment system has been established and is used consistently, teachers will be able to identify students' strengths and remedy weaknesses in order to achieve a higher level of student learning.

Student feedback is an essential piece of the formative assessment process and in the article written by John Hattie and Helen Timperley (2007), the importance of student learning is seen in answering the following three questions, "Where am I going? (What are the goals?), How am I going? (What progress is being made toward the goal?), and Where to next? (What activities need to be undertaken to make better progress?)" (Hattie & Timperley, 2007, p. 86). Hattie and Timperley (2007) state that when these questions are specifically asked and answered by both teacher and student alike, the best learning environment occurs.

Paul Black and Dylan Williams (1998) published an article of a meta-analysis related to formative assessment and the impact it has on student achievement. The study compiled a review of over 250 sources to determine the answer to three crucial questions: 1) Is there evidence that improving formative assessment raises standards? 2) Is there evidence that there is room for improvement? 3) Is there evidence on how to improve formative assessment? At the conclusion of the research review, Black and Williams (1998) found the answers to all three questions to be yes. The authors state that, "There is a body of firm evidence that formative assessment is an essential component of classroom work and that its development can raise

standards of achievement. We know of no other way of raising standards for which such a strong prima facie case can be made” (Black & Williams, 1998, p.148).

The Regional Educational Laboratory (2017) recently conducted a review of twenty-three different studies to determine the impact formative assessment has on student learning. Of these twenty-three studies, nineteen were deemed to have enough information to measure 30 different effect sizes (Klute, Apthorp, Harlacher & Reale, 2017). What was concluded was of all the students who engaged in the studies, those participated in the use formative assessment scored higher on “measures of academic achievement” than those students who were not part of the learning process that made use of formative assessment. In this thorough review of studies, it was determined that, “On average across all the studies, formative assessment had a positive effect on student academic achievement” (Klute et al., 2017, p. 6). This review can advise educators and schools as a whole on how to make use of formative assessment correctly in order to reach the highest level of academic achievement.

## **Methods**

### **Participants**

The action research conducted was in a private school general education setting with four different 8th grade middle school sections. The subject being taught in all four sections was United States History. Of the four sections, there are a total of 89 students with 45 female students and 44 male students. The student demographics show a student population that is 41% Caucasian, 23% African-American, 13% Asian, 13% Latino, 8% Multi, and 2% other. Of the 89 students in the class, five have a 504 plan, which is a general classroom accommodation plan. The 504 does not change student expectations, however, does allow extra accommodations, such as time to perform tasks, as well as seating that is conducive for each student. Two students are

inclusive students and have modified work to suit their needs. Also, there are a total of five international students from both China and South Korea who speak English as a second language. Tuition at this school is \$11,190 per year and currently 26 of the 89 students receive some level of tuition assistance. This school also has a 1:1 iPad program where all students are required to either buy or lease one of these tech devices.

### **Data Collection**

The focus of the action research was to determine what impact formative assessment has on student learning. The mixed-method system of collecting data was used with both quantitative and qualitative practices. While most of the data collected was quantitative, qualitative data was also gathered in order to get a more well-rounded and complete understanding of how formative assessment determined student learning. In relation to the quantitative data collected, tests were given to all eighty-nine students, while qualitative data was done through a student survey. The use of both of these data collecting techniques provided information from multiple perspectives and the result was an increased amount of data with a more acute reflection of results.

With regards to the quantitative part of the research, students were given summative assessments at the completion of multiple chapters to discover overall student learning. Due to the desire to see what impact formative assessment had on student learning, two chapters were taught with the use of formative assessments and two chapters were included in the data that did not make use of formative assessments. For this research, it was important that concrete data was produced with the chapters taught with formative assessment to pinpoint exactly where students were showing weaknesses so that the teacher could address them while the learning was taking place, not after the summative assessment was given at the conclusion of the chapter



being taught. Being that this school is a 1:1 iPad school, the formative assessment tool that was used to collect this data was a web-based tool known as Quizizz. Quizizz allows teachers to create both formative and summative assessments digitally for students. This formative assessment tool provides vital teacher feed-back that identifies individual student performance for each question. The individual student data provided includes the following: overall percentage, which questions were answered correctly and incorrectly, and both time spent on each question as well as overall assessment time. On top of this individual data, the data collected from this assessment tool provides overall classroom data such as: class percentage, time spent on each question and total assessment time, as well as which questions were the easiest and most difficult for students. Along with important teacher information, Quizizz allows students to access their individual data in order to review areas of weakness.

For the two chapters taught using formative assessment, the teacher researcher broke down each of the chapters into different lessons as prescribed by the eighth-grade curriculum being used. The first chapter had a total of four lessons and the second had five lessons. The teacher researcher taught each lesson and a digital formative assessment was created for each lesson, which students would take via iPad. Using the data compiled from the digital formative assessment tool, the teacher would then re-teach information that was below a class average of 80%. Each individual student was required to take notes on questions that were missed so that the information would be properly reviewed in preparation for the summative assessment at the conclusion of the chapter.

With regards to data collection, there was also a qualitative element as a part of the research. This involved the researcher making use of a survey in order to collect student responses and achieve research that was more ranging and comprehensive. The student survey

was conducted with the use of a three-part questionnaire and given at the conclusion to chapters the researcher taught making use formative assessment as well as those chapters that the researcher did not utilize formative assessment practices. The survey asked students the following three questions:

1. How did the use of formative assessment affect your confidence in taking the test at the conclusion of the chapter?
2. Did you receive a better grade on this test than you have on other tests taken this year?
3. Do you believe the use of formative assessment helped you learn the material and prepare you for the test?

The duration of the data collection period spanned three months from January 2018 to March 2018. Four different chapters were covered in the classroom during this time with the researcher using formative assessment practices on two of them. Regarding the two chapters that made use of formative assessment, each lesson was prepared with a formative assessment quiz using Quizizz for students to take at the completion of the lesson. When students finished these formative assessments, the teacher researcher was able to identify weaknesses and impediments that needed to be re-taught during the ensuing class period. Summative assessments were also given at the conclusion of each of the four different chapters, which covered all the important information learned throughout the chapter, in order to monitor student growth and achievement.

## **Findings**

### **Data Analysis**

The researcher in this action study was also the teacher of the students who received formative assessment methods in the teaching of the content. Despite this fact, there was nominal bias on the part of the researcher during the duration of the data collection period

considering the strong desire to understand the level of impact formative assessment has on student learning. Even though the researcher believed that formative assessment positively affects student learning and there are other studies and research that points to this hypothesis, the teacher researcher taught all four chapters of content during this study the exact same, with the exception of using formative assessment practices on two of the four chapters. Qualitative and quantitative data collection techniques were used in order to gain insight on the influence of formative assessment practices and to provide information that was impartial.

**Quantitative data analysis.** The quantitative data received was done through four separate summative assessments that provided results of student learning achievement over the course of a two-and-a-half-month teaching period. Each chart is listed by class period with all of the students running along the left-hand side. On each of the charts, the quantitative data shown gives the following information:

1. Specific individual student scores for each of the four assessments.
2. Individual average of the summative assessment with and without formative assessment.
3. The overall class average of the four summative assessments.
4. Class average of the summative assessment with and without the use of formative assessment (two summative assessments each).
5. The percentage increase or decrease with the average summative assessment scores using formative assessment versus the average summative assessment scores that did not use formative assessment.

Table 1

*Period 1 Data Collection*

<b>Class 1 students</b>	<b>Test #1 with form. assess.</b>	<b>Test #2 with form. assess.</b>	<b>Test #3 without form. assess.</b>	<b>Test #4 without form assess.</b>
A1	100%	93%	90%	91%
A2	100%	95%	97%	96%
A3	100%	95%	68%	78%
A4	98%	100%	87%	89%
A5	100%	93%	93%	80%
A6	98%	93%	97%	91%
A7	100%	100%	97%	100%
A8	100%	90%	92%	91%
A9	88%	85%	80%	76%
A10	100%	88%	80%	90%
A11	100%	95%	90%	91%
A12	100%	100%	97%	87%
A13	88%	95%	83%	93%
A14	100%	98%	90%	98%
A15	100%	100%	93%	98%
A15	100%	100%	93%	96%
A17	100%	98%	90%	84%
A18	98%	100%	92%	91%
A19	100%	100%	87%	88%
A20	90%	78%	70%	81%
A21	98%	100%	97%	91%
A22	100%	100%	97%	91%
A23	93%	100%	90%	98%
A24	100%	83%	90%	87%
A25	100%	73%	80%	78%
<b>Test average</b>	<b>98%</b>	<b>94%</b>	<b>89%</b>	<b>89%</b>
<b>Test average with form. assess</b>	<b>96%</b>			
<b>Test average without form. assess.</b>	<b>89%</b>			

<b>Average increase</b>	<b>7%</b>			
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In Table 1, twenty-five students took four difference summative assessments. In two of these, the teacher researcher made use of formative assessment methods and in the other two these methods were not used. In analyzing the data from Table 1, the results show that the test average using formative assessment was 96%. When looking at the average test scores that did not use formative assessment, the score dropped to 89%, which is a difference of 7%. This means that when using formative assessment, the students from Table 1 saw an average test increase of 7%.

Table 2

*Period 2 Data Collection*

<b>Class 2 students</b>	<b>Test #1 with form. assess</b>	<b>Test #2 with form assess.</b>	<b>Test #3 without form. assess.</b>	<b>Test #4 without form. assess.</b>
B1	100%	90%	93%	86%
B2	98%	100%	87%	87%
B3	98%	100%	100%	93%
B4	98%	100%	100%	90%
B5	98%	100%	93%	96%
B6	100%	100%	93%	90%
B7	98%	100%	85%	98%
B8	100%	100%	90%	93%
B9	100%	100%	100%	98%
B10	98%	95%	90%	83%
B11	100%	100%	97%	96%
B12	100%	100%	97%	92%
B13	100%	98%	90%	90%
B14	100%	98%	87%	96%

B15	100%	100%	100%	94%
B16	90%	90%	73%	72%
B17	100%	85%	73%	94%
B18	100%	Absent	87%	89%
B19	100%	100%	97%	98%
B20	93%	90%	73%	93%
B21	98%	93%	90%	89%
B22	100%	95%	83%	81%
<b>Test average</b>	<b>99%</b>	<b>97%</b>	<b>90%</b>	<b>91%</b>
<b>Test average with form. assess</b>	<b>98%</b>			
<b>Test average without form. assess.</b>	<b>90.5%</b>			
<b>Average increase</b>		<b>7.5%</b>		

In Table 2, twenty-two students took the same four summative assessments given by the teacher researcher. When looking at the data from Table 2, there was an average score of 98% when using formative assessment methods. In contrast, the test average without the use of formative assessment dropped to 90.5%, which is a difference of 7.5%. Again, there was an increase in the test results of 7.5% when using formative assessment techniques.

Table 3

*Period 3 Data Collection*

<b>Class 3 students</b>	<b>Test #1 with form. assess.</b>	<b>Test #2 with form. assess.</b>	<b>Test #3 without form. assess.</b>	<b>Test #4 without form. assess.</b>
C1	100%	87%	67%	91%
C2	100%	85%	80%	87%
C3	98%	98%	70%	84%
C4	100%	100%	87%	93%

C5	100%	90%	77%	84%
C6	93%	100%	83%	84%
C7	100%	93%	87%	80%
C8	98%	95%	87%	93%
C9	85%	83%	90%	76%
C10	100%	100%	90%	87%
C11	98%	88%	87%	67%
C12	100%	93%	83%	87%
C13	98%	85%	82%	87%
C14	100%	100%	93%	81%
C15	90%	85%	58%	77%
C16	100%	100%	70%	83%
C17	52%	68%	23%	88%
C18	100%	90%	78%	89%
C19	98%	95%	73%	80%
C20	98%	78%	72%	72%
C21	95%	95%	80%	70%
<b>Test average</b>	<b>95%</b>	<b>91%</b>	<b>77%</b>	<b>83%</b>
<b>Test average with form. assess</b>	<b>93%</b>			
<b>Test average without form. assess.</b>	<b>79.5%</b>			
<b>Average increase</b>	<b>13.5%</b>			

In Table 3, twenty-one students took the four summative assessments at the conclusion of the chapters being taught by the teacher researcher. The data shows that the average test results with the use of formative assessment was 93%. When not using formative assessment, the average test results dropped to 79.5%. The difference between the two average scores from

Table 3 is 13.5%. This shows that the students’ average test results increased by 13.5% when using formative assessment.

Table 4

*Period 4 Data Collection*

<b>Class 4 students</b>	<b>Test #1 with form. assess.</b>	<b>Test #2 with form. assess.</b>	<b>Test #3 without form. assess.</b>	<b>Test #4 without form. assess.</b>
D1	93%	100%	80%	53%
D2	90%	70%	57%	61%
D3	85%	90%	75%	74%
D4	100%	80%	73%	62%
D5	100%	100%	80%	79%
D6	100%	93%	93%	89%
D7	88%	88%	47%	87%
D8	93%	73%	70%	81%
D9	95%	95%	72%	77%
D10	93%	100%	83%	94%
D11	85%	73%	80%	82%
D12	100%	95%	77%	88%
D13	98%	98%	83%	77%
D14	98%	93%	73%	80%
D15	98%	95%	80%	93%
D16	85%	68%	50%	56%
D17	83%	93%	72%	64%
D18	80%	93%	53%	52%
D19	100%	83%	57%	89%
D20	98%	55%	83%	67%
D21	100%	100%	93%	71%
<b>Test average</b>	<b>93%</b>	<b>87%</b>	<b>73%</b>	<b>75%</b>



<b>Test average with form. assess</b>	<b>90%</b>			
<b>Test average without form. assess.</b>	<b>74%</b>			
<b>Average increase</b>	<b>16%</b>			

In Table 4 twenty-one students who took the same summative assessments as the students from Tables 1-3. When analyzing the data from Table 4, the data shows that the average test scores when using formative assessment was 90%. The average test scores without the use of formative assessment was 74%. In Table 4, there were the greatest gains seen of any of the four classes with a difference of 16%. This means that the students from Table 4 averaged 16 percentage points better when the teacher researcher made use of formative assessment methods.

In analyzing the data from all eighty-nine students, the results as shown in tables 1 through 4 reveals that there was an increase of the average summative assessment score when comparing the average of those tests that used formative assessment versus those that did not. When averaging the total gains from Tables 1-4, there was an average increase of 11% of the test scores when using formative assessment techniques to guide the teacher researcher in lesson planning.

Table 5

*International Students Data Collection*

<b>International students</b>	<b>Test #1 with form. assess.</b>	<b>Test #2 with form. assess.</b>	<b>Test #3 without form. assess</b>	<b>Test #4 without form assess.</b>
E1	100%	88%	80%	90%
E2	90%	78%	70%	81%
E3	100%	90%	93%	86%

E4	98%	93%	90%	89%
E5	98%	78%	72%	72%
<b>Test average</b>	97%	85%	81%	84%
<b>Test average with form. assess</b>	91%			
<b>Test average without form. assess.</b>	82.5%			
<b>Average increase</b>	8.5%			

There are five international students, two are from South Korea and three are from China. These students speak English as a second language and receive no accommodations with schoolwork. In analyzing the data related to these international students shown in Table 5, there was an increase in the average test scores when using at formative assessment. The data reveals that the test average using formative assessment was 91% while the average test score of those that did not use it was 82.5%, which is an average increase of 8.5%.

Table 6

*Inclusion Students Data Collection*

<b>Inclusion students</b>	<b>Test #1 with form. assess.</b>	<b>Test #2 with form. assess.</b>	<b>Test #3 without form. assess.</b>	<b>Test #4 without form. assess.</b>
F1	100%	87%	67%	91%
F2	85%	73%	80%	82%
<b>Test average</b>	92.5%	80.0%	73.5%	86.5%
<b>Test average with form. assess</b>	86%			
<b>Test average without form. assess.</b>	80%			
<b>Average increase</b>	6%			

Of the 89 students, two students are identified as being inclusion students and receive major accommodations and/or alterations to school work. In reviewing the data from these two students in Table 6, there were gains made to the overall test score average when using formative assessment. Students F1 and F2 saw an average test score of 86% compared to the average test score of 80% in the assessments that did not make use of formative assessment methods. The data shows that the average increase was 6% in these two students’ summative assessment scores.

Table 7

*504 Students Data Collection*

<b>504 students</b>	<b>Test #1 with form. assess.</b>	<b>Test #2 with form. assess.</b>	<b>Test #3 without form. assess.</b>	<b>Test #4 without form. assess.</b>
G1	85%	68%	50%	56%
G2	100%	80%	73%	62%
G3	83%	93%	72%	64%
G4	52%	68%	23%	88%
G5	95%	95%	80%	70%
<b>Test average</b>	83%	81%	60%	68%
<b>Test average with form. assess</b>	82%			
<b>Test average without form. assess.</b>	64%			
<b>Average increase</b>	18%			

There were five 504 students that receive classroom accommodations such, but not limited to, seating arrangement, extra time on tests, tests’ read aloud, that showed the greatest average increase of any of the students that were analyzed. In Table 7, these five students

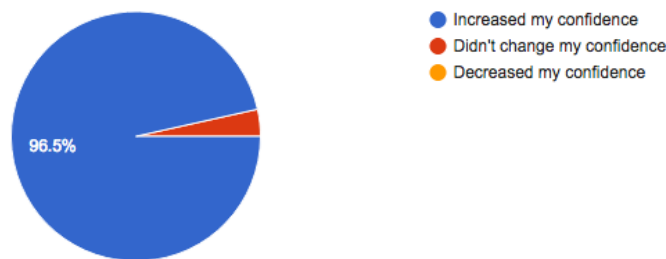
revealed a test average, with the use of formative assessment, of 82%. Compare this to the 64% average test score without formative assessment and what is seen is an average gain of 18%.

**Qualitative Data Analysis.** The qualitative data was done through a student survey at the conclusion of the chapters that were taught using formative assessment methods. In the student survey, the teacher researcher wanted students to answer three main questions.

In reviewing the 86 students’ answers (3 students were unable to respond to the survey due to absence) to these questions, the figures below show the following results:

**1. How did the use of formative assessment affect your confidence in taking the test at the conclusion of the chapter?**

86 responses

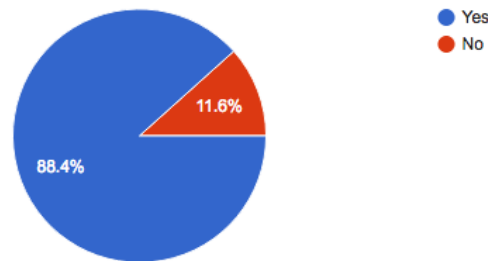


*Figure 1.* Impact of formative assessment on student confidence.

In Figure 1, the question was asked, “How did the use of formative assessment affect your confidence in taking the test at the conclusion of the chapter?” Of the students asked, 96.5% said that formative assessment increased the level of confidence in taking the test at the end of the chapter. The rest of the students, 3.5%, said that formative assessment had no impact on their level of confidence, while no students replied that formative assessment decreased their confidence level.

**2. Did you receive a better grade on this test than you have on other tests taken this year?**

86 responses

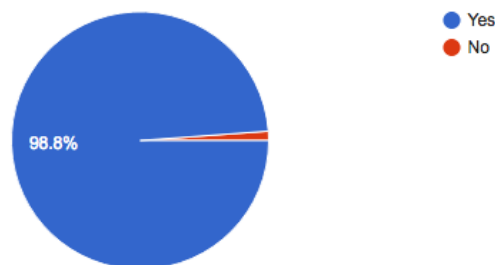


*Figure 2.* Impact of formative assessment on student test grade.

Looking at Figure 2, the question was, “Did you receive a better grade on this test than you have on other tests that you have taken this year?” Students by the number of 88.4% agreed that using formative assessment methods helped them receive a better grade than other tests that they have taken this year that did not make use of formative assessment methods. However, 11.6% of students said that the use formative assessment did not help improve their test grades.

**3. Do you believe the use of formative assessment helped you learn the material and prepare you for the test?**

86 responses



*Figure 3.* Impact of formative assessment on learning and test preparation.

Figure 3 the question was, “Do you believe the use of formative assessment helped you learn the material and prepare you for the test?” Students replied at a percentage of 98.8% that

did believe that the use of formative assessment helped in preparation for the summative assessment at the conclusion of the chapter. There was 1.2% that responded with no, the formative assessment did not help them prepare any better for the test.

## **Discussion**

### **Summary of Major Findings**

Over the course of this action research, it has become increasingly clear that formative assessment positively impacts student learning. Regarding the quantitative data, each of the four classes saw an increase to the overall summative assessment scores in the chapters that used formative assessment techniques in the teaching of students that ranged anywhere from 7% to 16%. In addition, in each of the areas that were analyzed in addition to the general population of eighth grade students, there was also an increase to the overall average scores when using formative assessment. These groups included international students, inclusion students, and 504 students. While each group made improvements, the biggest gains were seen in the 504 students, which are students that receive extra accommodations in learning. In relation to the qualitative data, it is evident, by student responses, that formative assessment techniques increase confidence, test scores, and preparedness.

### **Limitations of Study**

Some limitations in this study included the lack of formative assessment techniques that were used. The same method of using Quizizz as the source of formative assessment was used throughout the entire teaching and data collection process. In addition to this, other factors need consideration. These might include student's interests in different topics of learning, or classroom exercises and activities. In addition, student absences, extra-curricular activities and the like could have affected how student achievement on the different summative assessments.

**Further Study**

This research on the impact that formative assessment has on student learning suggests that more work be done in order to see the influence that other types of formative assessment methods have on student learning. Also, more research is needed to give more validity on just how much of a difference formative assessment can have on all different types of students with varying degrees on learning needs.

**Conclusion**

The data collected from this study advocates that formative assessment positively impacts student learning. This conclusion was reached through both quantitative and qualitative data techniques and shows that students average scores increased as a result of formative assessment. Along with this, the data also shows that students believe formative assessment increases confidence, learning, and preparedness. Teachers can benefit from the use of formative assessment to help inform their teaching and to help identify what students know versus what is unknown. Students can benefit from the use of formative assessment as well to more effectively determine what content is understood and to also serve as a guide to what needs to be improved upon.

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