

8-2016

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The Effects of Frequent Formative Assessment and Feedback on Summative Assessment

An Action Research Report
By Matthew J. Schugel

The Effects of Frequent Formative Assessment and Feedback on Summative Assessment

Submitted on August 7, 2016

in fulfillment of final requirements for the MAED degree

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A handwritten signature in black ink, appearing to read 'V. G. ...', written over a horizontal line.

Date 8.6.2016

Abstract

The purpose of this action research was to investigate the effects of frequent formative assessment and feedback on the summative assessment. The research took place over a four week period in two Algebra 9 classes with 58 participants. The participants completed a check in form at the beginning and end of the unit, three to five daily quizzes each week, and could participate in a discussion group at the end of the unit. The researcher provided feedback and kept a journal with observations. The data sources were analyzed and the researcher found students who took daily quizzes outperformed those who did not. Daily quizzes will continue to be implemented in the classroom. Future research will investigate the effects frequent formative assessments and feedback has on struggling learners.

Keywords: daily quizzes, formative assessment, feedback, summative assessment

Many students struggle when it comes to taking summative assessments. In order to improve student outcomes, there must be solutions in place along the way to help them. Students often can demonstrate they have mastered something during class, but then struggle when it comes time for the summative assessment. This is similar to that of a child trying to learn to ride a bike. The time during class is similar to a child using training wheels to help them ride a bike. Once the training wheels are taken off, the child will potentially struggle and fall off the bike. After struggling, they receive feedback before getting back on the bike to try again. Students should have the opportunity to assess their learning and receive feedback before attempting the summative assessment (Kamuche, 2005; Kornell, 2014; Kornell, Hays, & Bjork, 2009; Marzano, Pickering, & Pollock, 2001; Peterson & Siadat, 2009; Shirvani, 2009). In addition, teachers can observe students' successes and struggles to modify or change what they are doing in class to meet the needs of all students.

The researcher conducted this study at a junior high school in a suburban city in the Midwest United States. The school's student population is approximately 90% white, and then approximately 10% of students are American Indian, Asian/ Pacific Islander, Hispanic, and Black. The school also has 1% English Learners, 15% Special Education, and 20% Free/Reduced Priced Lunch. The research took place over a four week period in two Algebra 9 classes. The Algebra 9 course topics consist of exponents, factoring, quadratics, radicals, rational expressions, probability, and data analysis. The researcher used the data analysis unit at the end of the school year. Even though the course is titled Algebra 9, there are both ninth graders and accelerated eighth graders in the class. There were 58 students between the two classes. In the classes there were 14 accelerated eighth graders and 44 ninth graders. The

students in the study were 81% white, 7% Asian/Pacific Islander, 3% Hispanic, and 2% Black. Special Education students make up 10% of the participants in the study.

The researcher investigated how to help students become more successful on summative assessments. Instead of looking only at the ending point, it was the process of getting to the ending point that was changed. This change was the implementation of daily quizzes and feedback to help students before it was time for the summative assessment. This action research project was to determine the effects frequent formative assessment and feedback has on the summative assessment.

Review of Literature

Formative and summative assessments are used to assess students learning every day at school. Summative assessments provide teachers with the outcome of a student's work at the end of a course of study (Wallace, 2015). However, formative assessments give the student and teacher feedback that can be used to improve their outcomes throughout the unit of study (Wallace, 2015). Formative assessment is a critical aspect of learning for the students as well as for the teacher to make necessary adjustments to course material (Crumrine & Demers, 2007; Curtis, 2011). Frequent quizzes are a type of formative assessment that is used to increase student outcomes on summative assessments (Kamuche, 2005; Peterson & Siadat, 2009; Shirvani, 2009). The feedback given on formative assessments is another important aspect when it comes to increasing student outcomes (Kornell, 2014; Kornell, Hays, & Bjork, 2009; Marzano, Pickering, & Pollock, 2001; Peterson & Siadat, 2009). In order for students to improve or change an outcome, they need to know what is correct. If they are doing something incorrectly, they need to receive feedback to help them make the necessary adjustments.

Frequent Quizzes

College level courses were most commonly used to determine the effects frequent quizzes have on summative assessments. However, there has been some research done at the high school level. Shirvani (2009) investigated the use of frequent quizzes using a high school geometry class. There were four geometry classes with a total of 69 students, all taught by the same teacher, that were used to conduct the research. Two of the classes took daily quizzes the last 10 minutes of every day while the other two classes took a quiz each week on Friday. At the end of the six week term, the results from the two classes that took the daily quizzes were found to be significantly different than those of the two classes that took quizzes on Friday. In addition to increasing student achievement, Shirvani (2009) also found the classes taking daily quizzes had significantly outperformed the other classes when it came to homework scores as well.

There are additional studies involving college courses using frequent quizzes including Basic Statistics (Kamuch, 2005), Elementary Algebra (Peterson & Siadat, 2009), Introductory Psychology (Pennebaker, Gosling, & Ferrell, 2013), and Exercise Physiology (Dobson, 2008). Kamuch (2005) explored the use of weekly quizzes in Basic Statistics class over a four-year time frame with approximately 600 students. The results were that the Basic Statistics classes that had a weekly quiz outperformed classes that did not have a weekly quiz. Also, there was also a strong linear relationship between weekly quiz performance and test performance. Therefore, the quizzes can be used to help identify students who are struggling in the course.

Students who took frequent quizzes in their Elementary Algebra course significantly outperformed students who did not take frequent quizzes when it came to the summative assessment (Peterson & Siadat, 2009). The study took place from 2004-2006 with 222 students enrolled in courses with frequent quizzes and 1352 students in courses that did not have frequent

quizzes. The frequent quizzes in this study were given every class, every other class, or not at all. Of the 222 students who took the quizzes, 154 students took the quizzes every other class and 68 students took the quizzes every day. The researchers found the students who took frequent quizzes, whether every class or every other class, significantly outperformed the students who did not take frequent quizzes.

In the Introductory Psychology and Exercise Physiology classes the researchers found that frequent quizzing increases summative assessment scores (Dobson, 2008; Pennebaker et al., 2013). In both of these studies, the students took the quizzes on the internet using their own devices. Using the online quizzes, both of the studies found students to be better prepared for class. Because students were better prepared for class it allowed for a greater amount of learning time in class.

Retrieving information while taking a quiz, improves the chances of retrieving that information again later (Butler, 2010; Karpicke, 2012; Roediger & Butler, 2011). Roediger and Butler (2011) concluded that active repetition helps students with long-term retention of information more than passive repetition. Active repetition is when the student retrieves the information, where passive repetition was someone or something else giving the student the information. Karpicke (2012) discussed how each time something is retrieved, an additional retrieval cue is created. For students the more retrieval cues they have, the easier it will be to retrieve the information in many different settings.

In addition to successful retrieval of information helping future retrieval, unsuccessful retrieval attempts have also enhanced future learning (Kornell, 2014; Kornell et al., 2009; Richland, Kornell, & Kao, 2009). Each of these studies investigated how an unsuccessful attempt to retrieve information impacted future retrieval. When participants attempt to retrieve

information unsuccessfully, and then receive the correct information, they outperformed other participants who were provided with the answer and the question (Kornell et al., 2009; Richland et al., 2009).

The research has shown that frequent formative assessment in the form of daily quizzes can increase student learning and success on a summative assessment (Kamuche, 2005; Peterson & Siadat, 2009; Shirvani, 2009). In addition to daily quizzes, the effect of feedback on the summative assessment will also be investigated.

Feedback

Frequent quizzes alone will not allow students to reach their fullest potential. In addition to frequent quizzes the feedback students receive is an important aspect of their learning (Marzano et al., 2001). Feedback following formative assessments affects student outcomes as well as allows teachers to make necessary adjustments to their teaching (Kornell, 2014; Kornell et al., 2009; Marzano et al., 2001; Peterson & Siadat, 2009). Marzano et al. (2001) stated feedback need to be corrective, specific, and timely to have the greatest impact on student learning.

Corrective feedback involves students being told what they are doing correctly as well as what it is they can change or improve (Marzano et al., 2001). Corrective feedback allows students to make adjustments to their learning. In studies relating to frequent quizzing, corrective feedback was given to students following the quiz (Dobson, 2008; Kamuch, 2005; Pennebaker et al., 2013; Peterson & Siadat, 2009; Shirvani, 2009). These studies discussed the importance of students receiving corrective feedback as well as what the correct answer was to allow students to adjust their learning. Similarly to the corrective feedback in the studies on the use of frequent quizzes, corrective feedback was used in studies on retrieval of information

(Kornell, 2014, Kornell et al., 2009). When participants unsuccessfully retrieved information, they were given corrective feedback. The corrective feedback, along with the unsuccessful attempt at recall, helped enhance their learning.

Specific feedback allows students to know whether they have mastered a skill, partially mastered a skill, or have not mastered a skill (Marzano et al., 2001). Students need to know the end point they are working to reach. Dobson (2008) stated that formative assessments are most effective when they closely resemble the types of questions that will be on the summative assessment. If the questions are similar in style, it allows the feedback for the students to help them further understand the expectations of the outcome they are working to reach.

Students should also receive feedback in a timely manner. The most effective time for students to receive feedback is immediately after the assessment (Marzano et al., 2001). The use of online quizzes is one-way feedback can be provided immediately to students at the completion of the assessment (Dobson, 2008; Pennebaker et al., 2013). Kornell (2014) investigated the results if feedback was delayed 24 hours and not provided immediately for unsuccessful retrieval attempts. If feedback was delayed 24 hours and then the participant was tested 24 hours later, the learning was still enhanced by the previous unsuccessful attempt that occurred. Marzano et al. (2001) agreed with the idea that delayed feedback enhanced student learning. The average effect size of feedback immediately after the test was .72 and the effect size of delayed feedback was .56. These effect sizes show that delayed feedback does enhance the student's learning, but immediate feedback is more successful.

Frequent formative assessments are a way of students being able to work continually on their retrieval of knowledge (Butler, 2010; Karpicke, 2012; Roediger & Butler, 2011). As students retrieve knowledge, they are creating more retrieval cues to help them with future

retrievals of the information or similar information. In addition to working on the retrieval of information, frequent assessments allow students to receive feedback (Marzano et al., 2001). The formative feedback students receive allows them to adjust their learning to improve their course outcomes (Dobson, 2008; Kornell, 2014; Marzano et al., 2001; Pennebaker et al., 2013).

The purpose of this study is to determine the effects of frequent formative assessment and feedback on the summative assessment. The literature has shown the use of frequent formative assessments in the form of daily quizzes improves students' outcomes (Dobson, 2008; Kamuche, 2005; Pennebaker et al., 2013; Peterson & Siadat, 2009; Shirvani, 2009). In addition to the use of daily quizzes the literature also shows the positive effects of students receiving feedback (Kornell, 2014; Kornell, Hays, & Bjork, 2009; Marzano, Pickering, & Pollock, 2001; Peterson & Siadat, 2009). The most effective feedback the students can receive occurs as soon as possible (Marzano et al., 2001). Therefore, the present study investigates what effects the implementation of daily quizzes and immediate feedback will have on summative assessment scores for junior high mathematics students?

Methodology

The purpose of this study was to determine the effects of frequent formative assessment and feedback on the summative assessment. There were two Algebra 9 classes involved in the research which consist of 58 eighth and ninth grade students. The research was conducted during the Data Analysis unit. Throughout the unit, the researcher collected artifacts (check-in form, daily quiz scores, and summative assessment scores) for the purpose of the study. The students completed a check-in form at the beginning and end of the unit, the students took daily quizzes and received feedback, the researcher kept a daily journal of observations and field

notes, the students took a summative assessment at the end of the unit, and there was a student discussion group following the unit for students to provide their thoughts.

After getting background information of what the daily quizzes will be like, students completed a check-in form (Appendix A). The check-in form has six questions that were multiple-choice, open-ended, and check all that apply (multiple selection). On the check-in form, students provided their thoughts on daily quizzes and feedback. The questions about daily quizzes asked students whether they think daily quizzes would enhance their learning as well as how they felt about taking quizzes on a daily basis. The questions about feedback asked students to provide responses on the amount, quality, and types of feedback they receive from their teacher.

The daily quizzes (Appendices B and C) were conducted three or four days per week for the entire unit. The daily quizzes were two to five questions and would take place the first five minutes of class each day. The daily quizzes were graded and worth five points each day. Depending on the number of questions on the quiz, each question was worth one to three points in order for there to be five points total on each quiz. Students could receive partial credit to each question. The daily quizzes were a category that was worth 10% of their final fourth quarter grade. The questions on the daily quizzes were open ended questions. There were both procedural and conceptual questions on the quizzes. Each day when the students came into the classroom they grabbed a half sheet of paper that had the quiz questions on it and then spent the first five minutes of class completing the daily quiz. The questions on the daily quizzes were designed to assess learning and provide feedback (Appendix D) to students. The questions were based on what was done in class the previous day as well as anything in the unit leading up to that point. There were a total of 13 quizzes taken throughout the four weeks of the unit. There

were a few days throughout the research where a quiz was not given based on teacher discretion. The reason teacher discretion was used some days was because there were many students gone for field trips, standardized testing, and musical rehearsals.

As students began to complete the daily quiz the researcher moved on to grading, recording scores, and providing feedback to individual students. After grading the quizzes, the scores were recorded before passing them back to students. If the students got all the questions correct, they received their quiz back with the score on the top. If students did not get all the questions correct, the students would receive their quiz back with the questions marked wrong that were incorrect. If there was time at that point, the researcher provided the student feedback immediately. If there was not immediately time to provide feedback, the student received feedback at some point during the hour. The feedback on the daily quizzes was never pushed back to the next day, it was always provided as close as possible after completing the quiz.

The researcher kept a journal (Appendix E) throughout the unit to record observations and field notes. The observations and field notes were made of what was happening each day in class. The observations were anything that happened while students were taking quizzes. Some common observations made were common mistakes students made on the quizzes, the amount and type of feedback delivered to students, and any adjustments or changes made to lessons to meet the needs of students. The researcher recorded observations and field notes on the same sheet as the students' scores on the quizzes each day. Then, at the end of the day the researcher took time to combine any notes made and right out the observations and field notes in the journal.

At the end of the Data Analysis unit the students took the summative assessment (Appendix F). The summative assessment covered the most important items from the unit

including reading and interpreting graphs, stem-and-leaf plots, frequency tables and histograms, measures of central tendency, box-and-whisker plots, and misleading graphs. All of the 17 questions on the summative assessment were open-ended questions. The summative assessment was the common assessment created before the unit by the two Algebra 9 teachers. The material on the summative assessment was part of what guided the questions on the daily quizzes. Scores on the summative assessment were then recorded at the end of the daily quiz scores.

Following the summative assessment the students completed the check-in form (Appendix A). The check-in form they completed at the end of the unit was the same as the one completed at the beginning of the unit. When students completed the check-in form for the second time it allowed the researcher to see how students' thoughts on daily quizzes and the feedback they received changed from the beginning to the end of the unit.

At the end of the check-in form there was a part that asked students to let the researcher know if they were interested in participating in a discussion group. Eight students volunteered to participate in the student discussion group. The discussion group took place during advisory at the beginning of the day and lasted approximately 30 minutes. The discussion group began by discussing students' thoughts on the questions on the check-in form. The check-in form was the first part of the discussion to allow students an opportunity to expand on their responses and gave the researcher a chance to ask follow up questions. After students shared their responses and had a discussion about the check-in form, the researcher moved on to the five additional discussion prompts (Appendix G).

The researcher then compiled and analyzed all the data to determine the effects of daily quizzes and formative feedback on the summative assessment.

Analysis of Data

There are five data sources that were used to investigate the effects of frequent formative assessment and feedback on the summative assessment. The data sources that were used were the check-in form, daily quiz results, summative assessment results, teacher journal, and the student discussion group. The check-in form results were analyzed by comparing the responses at the beginning and end of the unit. The daily quiz scores were investigated and compared week by week as well as compared to summative assessment scores. The summative assessment results relative to student's third quarter grades were compared to summative assessment results from last year relative to student's third quarter grades. Third quarter grades were used because it was the most recent quarter that had been completed with the same students currently in the class. The teacher journal and student discussion group helped provide more insight into the results of the research.

The students took a total of 13 daily quizzes throughout the four weeks of the unit. The average percentage for the daily quiz scores remained very similar throughout the four weeks. As you can see in Figure 1 the results varied from 77% to 82%. The overall mean score for all the daily quizzes was 80% with a range of 5%. The daily quizzes had some questions that were review of previous material, but most of the material was covered most recently. Due to the fact that a majority of the questions were being assessed for the first time, this is a possible reason the daily quiz scores did not change much from week to week.

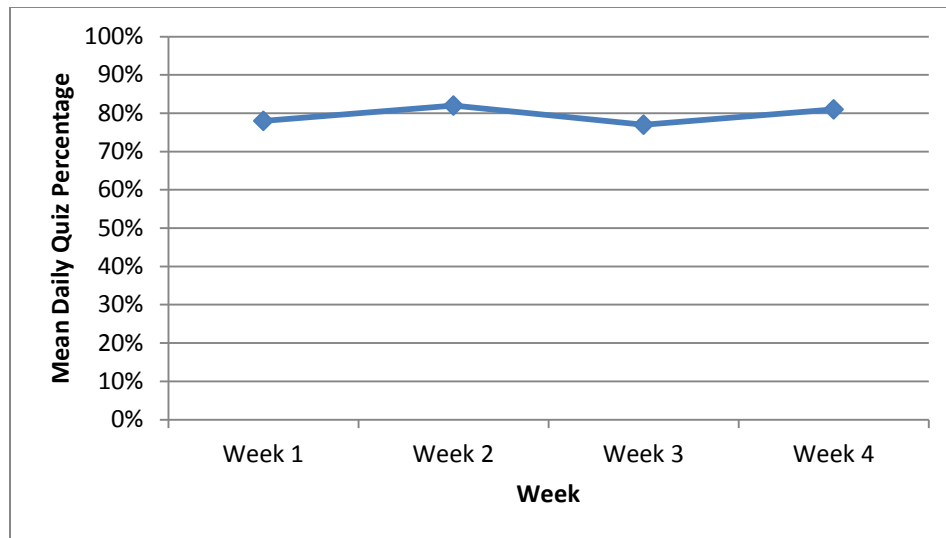


Figure 1. Mean daily quiz percentages for each week.

In the student discussion group the students shared their thoughts on the scores of quizzes throughout the unit. The consensus of the discussion group was that the score they got was not really significant because the quizzes were not worth very many points. What they said was the best part of the daily quizzes was the feedback they received. The students found the immediate feedback they received the most helpful part of the feedback. In addition to the feedback being immediate, the students stated they found it very helpful to have an opportunity to get help on a problem and then have a similar problem to attempt on their own. The students expressed they were alright not getting 100% on each of the quizzes because then they would get feedback to help them when it came time for the summative assessment. The students who got 100% on a daily quiz discussed how they felt when the quiz was passed back to them. Even though they did not receive feedback except for their score, they found that seeing they got 100% was good feedback to receive. The students shared their increase in confidence that they felt as a result of being successful on the daily quizzes. They believed that the confidence they felt carried over to their summative assessment at the end of the unit.

There were many observations made through the unit while students were taking daily quizzes. One common observation made throughout the unit was the benefit of correcting a quiz for each student on a daily basis and provide the necessary feedback. Many students did very well on the quizzes but it made it much easier to see if anyone was really struggling with the material. It was a lot more difficult for students to try and hide that they were confused or unsure what they were supposed to be doing. In addition to identifying students who are in need of additional help and or review, the quizzes helped identify class wide misconceptions or errors. One example of a common error that was found was students not putting titles and keys on their stem-and-leaf plots, frequency tables, and histograms. With so many students forgetting to put titles and keys, the researcher knew the students first needed to review what they need to put titles on. There was also an extra emphasis on titles for the remainder of the unit to ensure students did not forget them. When it came time for the summative assessment, only six students forgot a title or key at any point. 89.7% of students had all the necessary titles and keys they needed on the summative assessment.

For the summative assessment results, grades and scores from this year will be compared to those students who took the same class and test the previous year (Figure 2). The students who took the class the previous year took the same test and completed the same assignments. The difference between the two years was that students from the previous year did not take daily quizzes throughout the unit. To determine the similarity between the two years, the students' 3rd quarter grades were compared.

There were a total of 58 students in the class during the research this year. The mean grade for students this year during third quarter was 82.3%. For the previous school year there were a total of 60 students in class during the same time period as the research took place this

year. The mean grade the students last year had during third quarter was 81.6%. Looking at the percentages the two year's scores were very close. The two years' percentages were within 1% of each other when comparing the mean grade of all students.

The two sets of classes are very similar; therefore, their summative assessment results were compared to each other in Figure 2. On the summative assessment, students from this school year had a mean score of 88.9% and a median score of 89.3%. On the summative assessment, students from last school year had a mean score of 85.4% and a median score of 85.7%. Therefore, the students this school year who took the daily quizzes outperformed the students who did not take the daily quizzes last year based on the mean and median. From these results it appears that by taking the daily quizzes, the students performed better on their summative assessment.

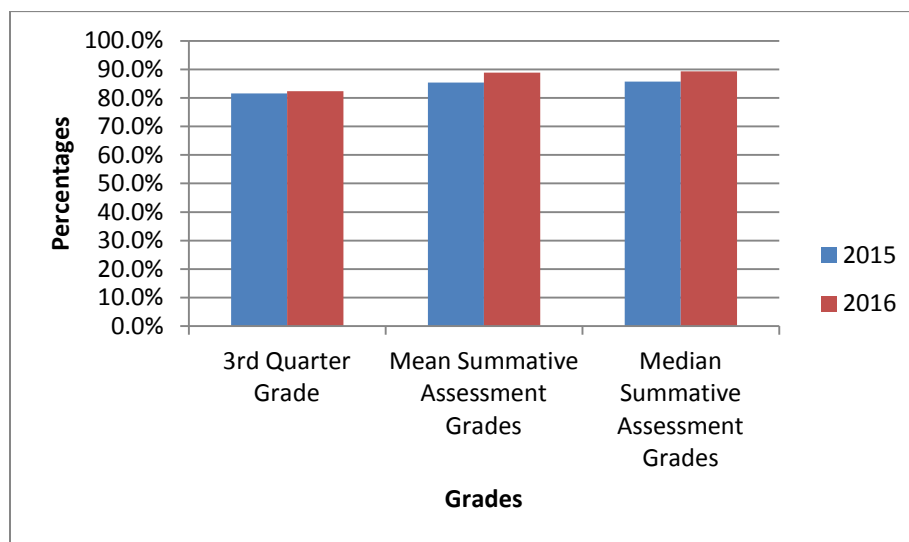


Figure 2. 2015 and 2016 percentages of mean 3rd quarter grade, mean summative assessment grade, and median summative assessment grade.

The classes this year that took the daily quizzes not only outperformed the previous year as a whole, there was a large decrease in the number of students who had less than 80% on their

summative assessment and an increase in the number of students who were above 80%. Figure 3 will compare the number of students that fall within each letter grade, the grading scale is 90% - 100% is an A, 80%-89% is a B, 70-79% is a C, 60-69% is a D, and anything below 60% is a F.

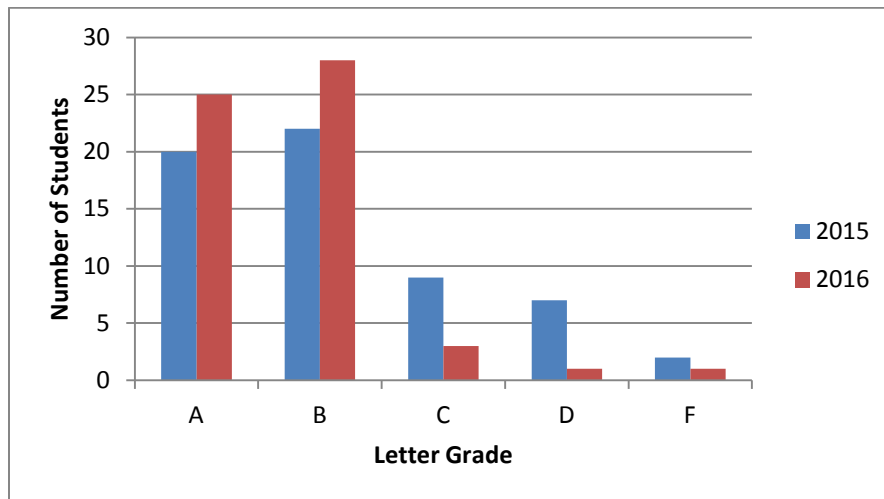


Figure 3. Student letter grades on summative assessment.

When comparing the two years one can see there is an increase in the number A's and B's for the students who took daily quizzes. In 2016 five more students received A's and six more students received B's than the students in 2015. There also was a large decrease in the number of students who got C's, D's, and F's when they were taking the daily quizzes compared to those students from the year before that did not take the daily quizzes. In 2016 there were six less students who got a C, six less students who got a D, and one less student that got an F on the summative assessment compared to 2015. Students who often struggle in class may not necessarily have the skills to self-monitor and provide themselves with feedback. By taking the daily quizzes they were given feedback on a daily basis to help them be successful in class.

During the student discussion group there were two students who were both between 65% and 70% for quarter three. Both of these two students shared their experience of taking daily quizzes and expressed how much they felt the feedback helped them. These students

shared how they felt they were being held more accountable because of the daily quizzes. When daily quizzes were not being used in class, they said they were able to sort of act like they were doing work and knew what they were doing. However, they usually did not know what they were doing and it would show up on the summative assessment. The excitement these students showed about their summative assessment scores after taking the daily quizzes is everything a teacher works towards. Both of these students expressed their belief that daily quizzes would help them in all of their classes.

The students filled out a check-in form (Appendix A) at the beginning of the unit and following the summative assessment. The check-in form allowed students the opportunity to provide their thoughts on taking daily quizzes and receiving feedback. The first two questions on the check-in form asked students whether daily quizzes would enhance their learning and also how they felt about taking daily quizzes. The responses to the first question about whether daily quizzes enhance their learning can be seen in Figure 4. On the post check-in form the number of students who said daily quizzes enhanced their learning all of the time increased by six, most of the time increased by four, some of the time decreased by six, and not at all decreased by four. On the pre-check in form, 58.62% felt daily quizzes would enhance their learning most of the time or all the time. While on the post-check in form 75.86% of students felt daily quizzes enhanced their learning most of the time or all of the time. The responses students gave were quite different than those they gave at the beginning of the unit. Before the unit there were four students who did not think daily quizzes enhanced their learning, after the completion of the unit there were no longer any students.

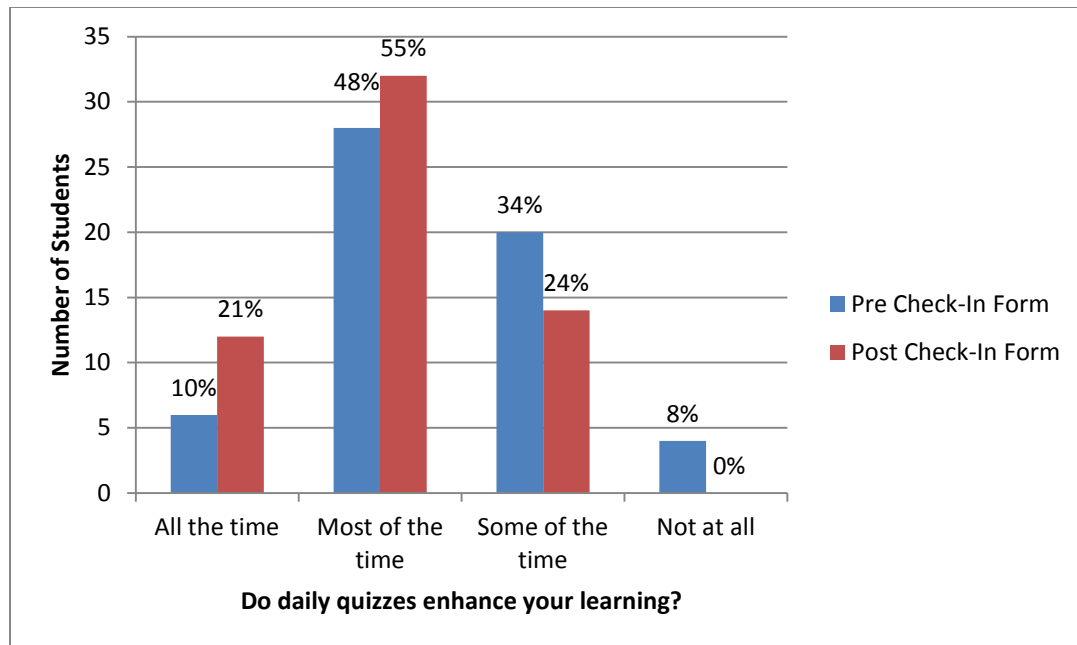


Figure 4. Student responses to check in form question: Do daily quizzes enhance your learning?

For the question asking the students how they feel about taking daily quizzes there were some common responses that occurred. The common responses that showed up on more than one-quarter of the check-in forms at the beginning were: I think it will be annoying taking them each day, I think they might be helpful but every day is a lot, they will be helpful, and they will not help my learning at all. The students' responses from the post check-in form and the student discussion group had a much different thought on how they felt about taking daily quizzes. The students expressed how they thought the daily quizzes enhanced their learning by giving them an opportunity to show what they have learned as they work to continue their learning. 24% of students shared that they felt the daily quizzes took away from their learning time because it took time at the beginning of class each day. The idea these students shared was to have only two quizzes per week instead of having them every day.

The responses students provided for how often they received feedback from their teacher showed that students felt they were receiving more feedback than before taking daily quizzes. On the pre check-in form approximately half the students responded that they receive feedback once per day or more. On the post check-in form, approximately 90% of students responded that they receive feedback once per day or more. The results of this question show that students were receiving much more feedback as a whole than they were before the daily quizzes began. Figure 5 shows students' responses to the question of how often they received feedback before daily quizzes began and how often they received feedback while taking daily quizzes. The daily quizzes provided a specific item in class that the teacher would provide feedback to every student on a daily basis.

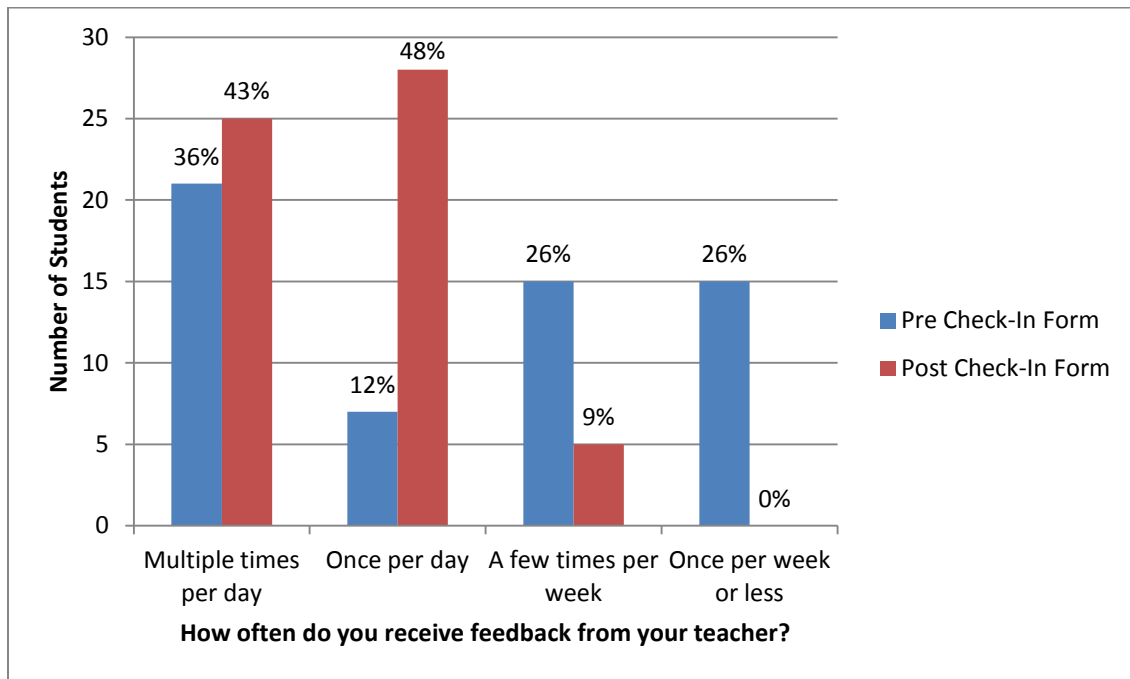


Figure 5. Student responses to the check-in form question: How often do you receive feedback from your teacher?

The data that was analyzed shows the effects daily quizzes and frequent formative feedback can have on summative assessments. Looking at daily quiz scores, summative assessment results, observations, and student responses one can see that the students who took daily quizzes this year outperformed students from last year who did not take daily quizzes. In addition to outperforming the previous year, the students who took daily quizzes felt more confident because of the feedback they received on a daily basis. The next section presents a plan of action moving forward into the following school year.

Action Plan

The purpose of the research was to determine the effects of frequent formative assessment and feedback on the summative assessment. The data sources used in the research were a pre and post check-in form the students filled out, daily quizzes, teacher journal, summative assessment, and student discussion groups. The data gathered using these sources showed that students benefited from taking daily quizzes and receiving frequent feedback. In addition to the summative assessment results improving, students shared they felt more confident that they had done well.

The research will have an impact on what the researcher does in the classroom. The researcher has seen the impact daily quizzes and formative assessment can have on students learning. The researcher is going to continue using the daily quizzes in the classroom. The one adjustment that will be made is that the quizzes will not be every day. Instead of students taking a quiz every day they will take two or three quizzes per week. When the lessons last multiple days, the daily quizzes make the most sense at the end of the lesson when the students have learned all the material. There are also days an idea is just being introduced, therefore, the quiz on this material would be after the instruction is complete.

The quizzes provide a way for students to receive feedback and hold students accountable. Taking the quizzes gives every student an opportunity to receive feedback each day they take a quiz. With the adjustment to taking two or three quizzes per week the researcher will make an extra effort to provide each student with feedback each day. The student responses on the check-in form and in the discussion group showed how helpful receiving feedback was for them. Continuing to take quizzes will provide the teacher an easy way to provide feedback as well as give students an opportunity to hold themselves accountable. The use of daily quizzes will make it so students will not be able to hide if they are confused or struggling with the course material. The quizzes allow the teacher to see how each student is doing and provide individual feedback.

Some limitations arose through this action research project. One limitation that arose was that students who took daily quizzes and those who did not take daily quizzes were different students from two different years. This was a limitation because the researcher was comparing the summative assessment results of these two groups even though there were more variables than just the use of daily quizzes. A second limitation was determining whether it was the daily quizzes, the feedback, or a combination of both that led to students' summative assessment scores increasing.

Educators are constantly looking for ways to increase student learning and achievement. This action research showed students who took the daily quizzes outperformed students who did not take daily quizzes throughout the unit. Therefore, if the quizzes help increase student learning they should continue to be used in classrooms. The students who seemed to benefit the most from the daily quizzes were the students who had struggled the most throughout the year. These students shared the increase in confidence they felt and how helpful they felt the feedback

was each day. Even though students who struggled the most throughout the year seemed to benefit the most, daily quizzes can be beneficial for all students. Students who were successful in class shared that they were able to use the daily quizzes to monitor their learning.

Future research could investigate the types of questions that will benefit the most successful students. The types of questions that could be investigated to benefit the most successful students could be both procedural and conceptual questions. These questions could also have students apply what they have learned to real life examples. Future research could also look at the effect different types of questions would have on student's summative assessment scores. All of the questions on the daily quizzes and summative assessment were open ended questions. The future research could investigate the effect of multiple choice questions, true or false questions, or a combination of different types.

In the action research it seemed as if the daily quizzes benefited students who struggled the most throughout the year. This is something that should continue to be investigated in future research. Students who struggle need as much feedback as possible to help them be successful. These students also need to be held accountable to their learning and daily quizzes could be exactly what they need. The researcher is teaching a class this upcoming year for students who did not pass Algebra 9 the first time they took it. They plan on continuing to research the effects daily quizzes and formative feedback has on the summative assessment when it comes to these students who have struggled in the past.

The check-in form students filled out at the beginning of the unit revealed that 52% of students did not receive feedback once per day or more. Throughout the action research the number of students who did not receive feedback once per day or more declined from 52% to 9%. In addition to future research involving the use of daily quizzes, the amount of feedback

and the types of feedback students receive could also be investigated further. Potential follow up questions are: Does an increase in feedback increase student learning? What types of feedback are most effective to increase student learning?

Throughout the present study, the use of daily quizzes and frequent formative feedback increased student performance on summative assessments. In addition to increasing student achievement, daily quizzes helped students feel more confident when it came time for the summative assessment. Educators want all students to be successful and work diligently to help them be successful. One solution educators can use to help students be as successful as possible on summative assessments is the use of daily quizzes as a way of frequent formative assessments.

References

- Braun, K. W., & Sellers, R. D. (2012). Using a "daily motivational quiz" to increase student preparation, attendance, and participation. *Issues in Accounting Education, 27*(1), 267-279.
- Butler, A. C. (2010). Repeated testing produces superior transfer of learning relative to repeated studying. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 36*(5), 1118-1133.
- Crumrine, T., & Demers, C. (2007). Formative assessment: redirecting the plan: high school science teachers study and implement formative assessment strategies. *The Science Teacher, 74*(6), 64.
- Curtis, S. M. (2011). Formative assessment in accounting education and some initial evidence on its use for instructional sequencing. *Journal of Accounting Education, 29*(4), 191-211.
- Dobson, J. L. (2008). The use of online quizzes to enhance class preparation and scores on summative exams. *Advances in Physiology Education, 32*(4), 297-302.
- Kamuche, F. U. (2005). Do weekly quizzes improve student performance? *Academic Exchange Quarterly, 9*(3), 188-192.
- Karpicke, J. D. (2012). Retrieval-based learning: active retrieval promotes meaningful learning. *Current Directions in Psychological Science, 21*(3), 157-163.
- Kornell, N. (2014). Attempting to answer a meaningful question enhances subsequent learning even when feedback is delayed. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 40*(1), 106-114.

- Kornell, N., Hays, M. J., & Bjork, R. A. (2009). Unsuccessful retrieval attempts enhance subsequent learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 35(4), 989-998.
- Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria: ASCD.
- Pennebaker, J. W., Gosling, S. D., & Ferrell, J. D. (2013). Daily online testing in large classes: boosting college performance while reducing achievement gaps. *PLoS ONE*, 8(11).
- Peterson, E., & Siadat, M. V. (2009). Combination of formative and summative assessment instruments in elementary algebra classes: a prescription for success. *Journal of Applied Research in the Community College*, 16(2), 92-102.
- Richland, L. E., Kornell, N., & Kao, L. S. (2009). The pretesting effect: do unsuccessful retrieval attempts enhance learning? *Journal of Experimental Psychology: Applied*, 15(3), 243-257.
- Roediger III, H. L. & Butler, A. C. (2011). The critical role of retrieval practice in long-term retention. *Trends in Cognitive Sciences*, 15(1), 20-27.
- Shirvani, H. (2009). Examining an assessment strategy on high school mathematics achievement: daily quizzes vs. weekly tests. *American Secondary Education*, 38(1), 34-45.
- Wallace, S. (2015). *A dictionary of education*. Oxford, UK: Oxford University Press.

Appendix A
Algebra 9 Check-In Form

Completion of this survey is voluntary. By completing this survey, you are giving your consent to participate in this study. Completing this survey is completely voluntary and you may quit at any time.

1. Do frequent quizzes enhance your learning?
 - a. All the time
 - b. Most of the time
 - c. Some of the time
 - d. Not at all

2. How do you feel about taking frequent quizzes?

3. How often do you receive feedback from your teacher during class?
 - a. Never
 - b. Once per week or less
 - c. A few times per week
 - d. Once per day
 - e. Multiple times per day

4. Does the feedback from your teacher help your learning?
 - a. Always
 - b. Usually
 - c. Sometimes
 - d. Never

5. Which types of feedback do you receive from your teacher? Check all that apply.
 - Verification (Correct or Incorrect)
 - Correct Response ("The correct answer is...")
 - Try again (The student tries again)
 - Error Flagging (The teacher shows where the error occurred and the student fixes it and finishes the problem)
 - Elaborated (Explaining what is incorrect about the problem or reteaching)

6. Please share any additional thoughts on which type of feedback you find most beneficial to your learning.

If you would be interested in participating in a student discussion group following the unit please let me know. The student discussion group is voluntary and will be 30 minutes during advisory. The discussion group would involve questions relating to responses that were provided when students completed this check-in.

Appendix B
Daily Quiz Example

Name: _____

Frequency Table and Histogram Quiz

The following data is the high temperature for 20 consecutive days.

47, 62, 71, 51, 54, 62, 68, 74, 66, 60, 59, 54, 48, 50, 51, 58, 62, 65, 70, 75

1. Create a frequency table.
2. Create a histogram to display the data.
3. Describe the data using your frequency table and histogram. Are there any patterns or trends?

Appendix C
Daily Quiz Example

Name: _____

Mean, Median, Mode, Range Quiz

Find the mean, median, mode, and range for the following data: 7, 14, 15, 6, 10, 7, 8, and 12.
Put your answer on the line and show your work for each question.

1. Mean = _____

2. Median = _____

3. Mode = _____

4. Range= _____

Appendix D Feedback Provided to Students

All students received feedback on their daily quizzes whether the questions were correct or incorrect. In addition to that feedback, below are some other types of feedback students received throughout the unit.

- Find mistake and try again: The student is told to look at their work to see if they can find the error and correct it.
- Correct answer: Students were provided with the correct answer, which allowed them to attempt to solve the problem again knowing what the answer was.
- Solution and another problem: The student is given the work and solution to the problem to see how to complete it. In addition, they are given another problem that is similar for them to practice.
- Small group review: If a group of students made a similar mistake, a small group can be used with those students to review the mistake.
- Large group review: If there is a common mistake made by a lot of students in the class that was a sign some material needed to be reviewed before moving on.
- Individual review and feedback: A student received specific feedback and review based on mistakes they made on their quiz.

Appendix E
Teacher Journal Prompts

What successes or struggles did students have on the quiz today?

What feedback was provided to students who struggled on the quiz today?

How did I assess the effectiveness of feedback for students who struggled? Was it effective?

What adjustments were made to today's lesson based on quiz results? Why?

Appendix F
Summative Assessment

Quiz 10-1 to 10-4

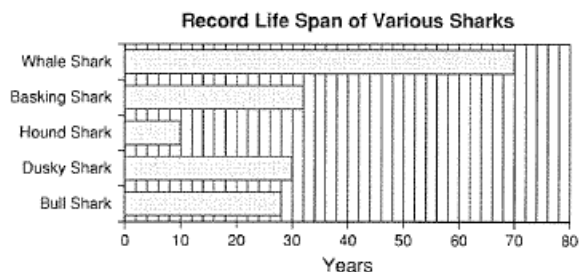
Name _____

Use the bar graph for Exercises 1–3.

1. Which shark lived longer than any other shark?

2. About how long did the Basking Shark live?

3. Which shark lived about one-third as long as the Dusky Shark?



4. The number of rushing yards completed by a running back on a professional football team in each of the 16 regular season games is given. Use the data to make a stem-and-leaf plot with a title and a key.

Rushing Yards							
43	52	98	96	74	35	73	56
57	48	65	78	72	81	56	68

5. The test scores for two Algebra classes are shown in the stem-and-leaf plot.

a. How many students scored 100? _____

b. How many students in Period 5 scored greater than 80? _____

c. What was the lowest score in Period 3? _____

d. Which Period had more scores? _____
How many more? _____

Period 5				Period 3			
4	2	0	0	5	1		
	6	5	2	6	3	8	9
7	7	4	2	7	2	9	9
		8	3	8	4	4	7
	9	3	1	9	1	3	6
				10	0	0	0

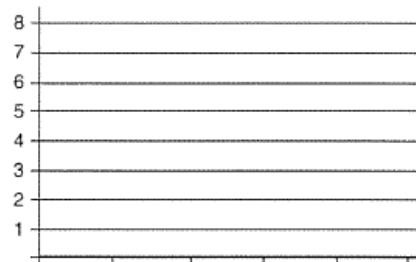
Key: |6|8 means 68
3|8| means 83

6. The number of calls per day to a fire and rescue service for three weeks is given below. Use the data to complete the frequency table.

Calls for Service										
5	17	2	12	0	6	3	8	15	1	4
19	16	8	2	11	13	18	3	10	6	

Fire and Rescue Service	
Number of Calls	Frequency
0 - 3	
4 - 7	
8 - 11	
12 - 15	
16 - 19	

7. Use the frequency table in Exercise 6 to make a histogram with a title and axis labels.
8. Which intervals have the same frequency?



9. 8, 12, 17, 12, 10, 8

mean: _____

median: _____

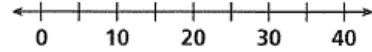
mode: _____

range: _____

10. Mr. Bernard drove **46, 4, 64, 50, and 56** miles on his last five trips. For each question, choose the mean, median, or mode, and give its value.
- Which value describes Mr. Bernard's average driving distance?
 - Which value would Mr. Bernard tell his boss to convince him that he spends too much time on the road? Explain.

11. Use the data to make a box-and-whisker plot. 21, 22, 10, 22, 30, 4, 37, 15, 14

a. Order the data: _____



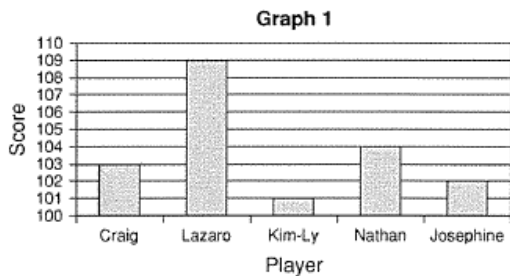
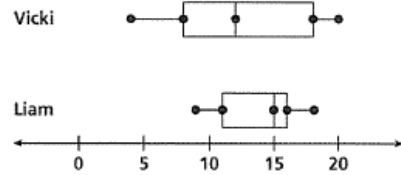
b. Min: _____, Q1: _____, Med: _____,
Q3: _____, Max: _____

The quiz scores of two students are shown in the box-and-whisker plots.

12. Who has the higher median score? _____

13. Who has the highest score? _____

14. Who has the most consistent scores? _____



Graph 1 shows the number of points scored by five players in a game.

15. Explain why the graph is misleading. _____

16. What might someone believe because of the graph? _____

17. Which player do you think made the graph? _____

Appendix G
Student Discussion Prompts

1. What were your thoughts on taking daily quizzes at the beginning of the unit?
2. Did your thoughts on taking daily quizzes change throughout the unit? If so, why do you think your thoughts changed?
3. Did taking daily quizzes change how you approached any part of the class? For example homework, asking questions, checking answers, or anything else.
4. What type of feedback do you feel helps you the most to improve your learning? Why?
5. What form of receiving feedback do you feel improves your learning? Written, verbal, conversation, or other?