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ANALYSIS OF ALTERNATIVE ASSESSMENTS IN THE MATHEMATICS CLASSROOM

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HONORS PROJECT

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Abstract

The purpose of this action research is to examine alternative, summative assessments with a focus on instructional approaches – particularly oral and visual assessments. My aim was to determine the benefits of implementing alternative assessments. The participants are students in a seventh-grade mathematics classroom who chose their assessment and completed open responses.

Introduction

A testing day in a K-12 mathematics classroom typically consists of students scribbling down what they can recall from their notes and homework. Students usually replicate the procedures they learned in class on a test. Assessments should measure students' conceptual understanding in addition to their procedural understanding. Research on alternative assessments is crucial in order to discover effective ways to measure procedural and conceptual understanding. According to the National Assessment of Educational Process, conceptual understanding is when students have the ability to identify and apply principles using varied representations of concepts (2003). Procedural understanding is when students are able to complete a mathematical procedure. The National Council of Teachers of Mathematics (NCTM) encourages further research on effective assessments that achieve accurate measuring of mathematical knowledge of procedures and concepts (Tarr et al., 2013). NCTM recognizes the importance of research on assessments, in order to find assessments that are valid and reliable when measuring the Standards of Mathematical Practice (Tarr et al., 2013). Mathematics teachers need alternative assessments in order to effectively support student learning.

I hope to support student learning beyond recall and memory by accessing deeper understanding. Summative assessments should not be solely for assessing procedures, but also the mathematical knowledge and understanding that goes along with the procedure. Summative assessments evaluate student learning at the end of an instructional unit. I hope to gain further insight into effectiveness of pre-assessment instructional approaches in order to use the findings to influence my own teaching outside of student teaching and action research. I aim to share observations from my study to best support the use of alternative assessments in my future mathematics classroom. My hypothesis is that after instructional approaches supporting

alternative summative assessments, students will be able to complete a visual synthesis or interview alternative assessment measuring their procedural and conceptual knowledge.

Literature Review

The purpose of my action research is to explore alternative summative assessments, (i.e. interviews and visual syntheses), gain experience of instructing students how to complete an alternative assessment, and analyze the benefits of alternative assessments. The following studies establish the foundation of my research study. It is important to understand the background and past research on assessments, such as the disadvantages of traditional assessment, standards of assessments, the components of oral and visual assessments, and previous research on oral and visual assessments. With this research, I will have a well-rounded perspective when I begin my own research study.

Traditional Assessments

My experience with traditional assessments in mathematics consists of recalling formulas and procedures for problems that mirror problems from worksheets and homework. Adeyemi's study describes the disadvantageous aspects of traditional assessments. Traditional assessments have been primarily teacher-based with limited student involvement, meaning that the students are not given opportunities to express their opinions about the assessments they perform. These assessments promote the value of extrinsic rewards, rely on competition, and encourage academic dishonesty – such as cheating or plagiarism. With traditional assessments as the primary means of assessment, students lack initiative in their learning; therefore, students lack learners' autonomy, which is the "ability for making all the decisions concerning about all aspects of his/her learning" (Adeyemi, 2012, p. 4494). In my study, students will decide which

assessment they will complete: traditional, interview, or visual synthesis. This opportunity supports their learner autonomy by allowing students to activate their own skills and knowledge (Adeyemi, 2012, p. 4494). It is important to know the standards of assessments when designing and implementing assessments for students.

Standards of Assessments

NCTM establishes nationwide standards for assessments in the mathematics classroom. In one article, NCTM (2000) discusses the concept of an assessment-centered learning environment, meaning teachers strongly incorporate assessments into teaching, continually assessing students' progress and learning; the progress of student learning is the focal point of the learning environment. There are two components teachers need to understand about assessments: *what* and *how* to assess (NCTM, 2000). As a teacher, I need to consider *what* I am assessing and *how* I plan to assess when designing my unit and lessons, so my instructional approaches will prepare students for my alternative assessments. The focus of what I am assessing is not only knowledge of mathematical procedures but also the mathematical concepts – as well as the Standards of Mathematical Practices (SMPs). NCTM seeks to find assessments that are valid and reliable when measuring the SMPs (Tarr et al., 2013).

The Common Core State Standards for Mathematics (CCSM) describes the SMPs, which are behaviors and habits of mind that students ought to experience and demonstrate (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). These eight SMPs are listed below in Table 1.

Table 1 *Standards for Mathematical Practice*

SMP #	Title
1	Make sense of problems and persevere in solving them.
2	Reason abstractly and quantitatively.
3	Construct viable arguments and critique the reasoning of others.
4	Model with mathematics.

5	Use appropriate tools strategically.
6	Attend to precision.
7	Look for and make use of structure.
8	Look for regularity in repeated reasoning.

If students are expected to engage in the SMPs during teaching, then assuredly these same SMPs should be assessed. My instructional approaches need to support the SMPs in order for students to engage in these practices. Students will need to be prepared for assessments measuring their engagement in the SMPs as well as procedural and conceptual knowledge, in order to have a well-rounded understanding of the mathematical concepts being assessed. While assessments measure these components, they should also meet the assessment principle standards.

The assessment principle in the classroom is further explained by NCTM in the *Principles and Standards for School Mathematics*. Specifically, the authors examine goals of and for assessing students as well as gather reliable and valid information about students' learning. The assessment principle is the idea that "assessment should support the learning of important mathematics and furnish useful information to both teachers and students" (NCTM, 2000, p. 22). Popular belief considers assessments to be done to students and for teachers, where students go through the motions of completing assessments for teachers to evaluate and simply record scores. Rather, assessments are for the sake of students to guide their learning (NCTM, 2000, p. 22), in which students are actively engaged in their assessments. The authors stress that teachers stop assessing based on whether the student got the right or wrong answer, because the black or white approach limits the opportunity to see students' procedural and conceptual knowledge. Instead, teachers need to start assessing based on students' processes of mathematical tasks and procedures (NCTM, 2000). I will structure my assessments to go beyond students providing a correct answer and delve into students' reasoning for their answers. I

further explore two types of alternative assessments that gain insight into student processing and understanding of mathematical procedures: oral and visual.

Oral Assessments

I focused on Joughin's (1998) study distinguishing the dimensions of oral assessments in order to understand the complexity of oral assessments. The study analyzed 77 articles focusing on oral assessments, including texts from specialists on assessments. This analysis determined six dimensions of oral assessments and the ranges of each (Joughin, 1998). Table 2 contains the six dimensions and their characteristics, in addition to how I plan to structure my oral assessment based on these dimensions:

Table 2 *Dimensions of Oral Assessments*

Dimension	Characteristics	How I plan to implement
Primary Content Type	<ul style="list-style-type: none"> • Refers to what the assessor is looking for: <ul style="list-style-type: none"> – Knowledge and understanding – Applied problem solving ability – Interpersonal qualities 	<ul style="list-style-type: none"> • Knowledge and understanding • Applied problem solving abilities
Interaction	<ul style="list-style-type: none"> • Refers to how the assessor and candidate act, respond, and interact with each other • Ranges from presentation style to dialogue style 	<ul style="list-style-type: none"> • Presentation style <ul style="list-style-type: none"> – I will ask students questions and they will respond – No dialogue where we build answers off of each other's processes
Authenticity	<ul style="list-style-type: none"> • Refers to how much the assessment mimics a real life situation • Ranges from contextualized (highly authentic) to decontextualized 	<ul style="list-style-type: none"> • Combination of contextualized and decontextualized <ul style="list-style-type: none"> – Contextualized problems will assess conceptual understanding and applying to real life situations – Decontextualized problems will assess procedural understanding
Structure	<ul style="list-style-type: none"> • Refers to whether the questions are predetermined and how strict the assessors 	<ul style="list-style-type: none"> • Closed structure <ul style="list-style-type: none"> – All questions will be

	will adhere to the predetermined questions • Ranges from closed structure (order set of questions, no deviation) to an open structure (loose and dependent on answers)	predetermined and given to all students
Examiners	• Refers to the assessors themselves • Ranges from self-assessors to peers assessors to authority assessors	• Teachers – Including me and my Cooperating Mentor Teacher
Orality	• Refers to the extent that the assessment is oral • Ranges from purely oral to secondary oral	• Primarily oral – Students will be provided with prompts on paper, scrap paper and pencil to show work while talking through their process

These are necessary components to consider when determining the appropriate methods of oral assessment for the classroom. After understanding these dimensions to oral assessments, I am able to determine the important focal points of oral assessments – especially when analyzing research studies implementing oral assessments.

One study implemented oral assessments to identify the practicality and effectiveness of oral assessments. Iannone and Simpson's (2012) study took place in the United Kingdom, focusing on the interrogation method (also known as the presentation style mentioned above) of oral assessments. The interrogation method is an oral performance method where the individual converses with the assessor about his or her attempts to find solutions. Their study took place in an undergraduate course on graph theory, where the authors replaced one week of tutorials – which are weekly group quizzes – with one-on-one oral assessments. The data were collected qualitatively through open responses and quantitatively through questionnaires. The findings reveal that compared to the final examination, oral assessment is an accurate measure of assessing students' knowledge; accuracy refers to the students demonstrating a thorough understanding of the content. Students agreed with this impression, but preferred the final

examination as the major assessment for the course (Iannone & Simpson, 2012). Students do not want to jeopardize their course scores when completing alternative assessments. I will be aware of my students' concerns for their final grade when offering alternative assessments. This next study uses the alternative assessment as the final assessment as well for a university-level course.

Visual/Conceptual Assessments

This study focuses on my second alternative assessment: visual assessments. Simpson (2004) develops and implements a visual synthesis method as a form of assessment for a freshmen-level calculus course in a university. Simpson uses the visual synthesis assessment and does not have another assessment to compare to the visual synthesis. A visual synthesis is a depiction of mathematical concepts covered in the course, the connections within those concepts, and the ways those concepts can be applied in real life. Students complete the visual synthesis based on their own skills; some students incorporate illustrations, some students create concept maps, and some students create visual stories. Simpson evaluates the visual synthesis based on four components that are described in Table 3 (2004).

Table 3 *Visual Synthesis Evaluation*

Assessment Components	Characteristics
Completeness	<ul style="list-style-type: none"> • Are all key concepts included? • Is there sufficient detail and evidence of understanding the meaning and usefulness of concept?
Connections	<ul style="list-style-type: none"> • Does the final product communication clearly the connections between and among concepts?
Explanations	<ul style="list-style-type: none"> • Is there adequate explanation of all elements of visual synthesis?
Creativity	<ul style="list-style-type: none"> • Is the final product presented in a creative and appropriate way to demonstrate learning?

The benefit of this assessment approach is the fact that students do the synthesizing – a higher learning domain in Bloom's Taxonomy (Kraftwohl, 2002). Instead of asking students to recall, the author has students think about the mathematical concept and identify the connections

and concepts and communicate those ideas. Students were given the opportunity to provide feedback through a general course evaluation. The qualitative research demonstrated that overall the students felt they had a better understanding of calculus after producing a visual synthesis (Simpson, 2004). I have personally never come across this mathematical alternative assessment, but see the strong benefits of assessing students' conceptual knowledge of mathematics. This next study is another assessment that I have not experienced in the mathematics classroom.

In fact, I did not come across research implementing concept mapping in a mathematics classroom. Williams's study focuses on another type of visual assessment of concept mapping and the advantages, challenges, and disadvantages to using concept mapping as an assessment. Even though this study investigates outcomes from one student in a nursing course, I draw upon this study because there is a unique aspect to gaining reasoning and sense making of the process when using concept mapping as an assessment tool. William's defines concept maps as a framework of representing concepts; basically, concept maps are constructions of a mind map of basic words or concepts centrally and relevant connections radiating from it, with the thickness of lines denoting the importance of idea being linked to the main concept (Williams, 2004). Mind maps can include infinite associations and branches; for the sake of concept mapping as assessments, assessors need to provide limitations to particular concepts.

Concept maps help students connect existing knowledge to new knowledge; evaluators are able to see if those connections are accurate, as well as see how the students process the new knowledge. Tutorial support was needed before the final concept map assessment in order for the student to understand the expectation (Williams, 2004). This study emphasizes strong support in instructional approaches in order to prepare students to complete a concept map as a summative assessment. I will pursue this alternative assessment in my study because of its focus

on student reasoning and processing. Like the previous study, students completing a concept map will need to have a thorough understanding of the mathematical concepts in order to make connections.

I noticed that the above studies did not offer alternative assessments in secondary school settings, but rather in university-level courses. My study focuses on implementing these studies in high school mathematics classroom, where I will prepare the students in my instructional approaches leading up to the alternative assessments. My hypothesis is that after instructional approaches supporting alternative summative assessments, students will be able to complete a visual synthesis or interview alternative assessment measuring their procedural fluency, conceptual understanding, and mathematical reasoning.

Methodology

School and Class Setting

I conducted this action research project at my 2015 student teaching placement in a seventh-grade mathematics class. Fostoria Junior/Senior High School is an urban school. A majority of the students qualify for free-or-reduced meals at school, which alludes to the fact that most of my students come from lower socio-economic households. Participants were all the students in one of my seventh-grade mathematics classes, totaling 11 students. The class takes place during the fourth period of the day for 50 minutes a day throughout the whole year. None of the students have Individualized Education Plans, 504 plans, or are English language learners; however, one student has an emotional disturbance disorder, one has an anxiety disorder, and two are considered underperforming students – as determined by a limited score level on the past year's Ohio Achievement Assessment. For the student with emotional disturbances, when his

emotional difficulties and anger are triggered he is temporarily dismissed from class to calm down for 2-5 minutes. For the student with an anxiety disorder, when her anxiety heightens, then she uses a stress ball to release tension. The two underperforming students struggle paying attention and often spend their study hall periods in our classroom, therefore, spending two periods in math and receiving additional assistance.

I needed to prime the classroom to establish a learning environment conducive to alternative assessments. Priming is a teaching strategy that helps prepare students for an activity that they are unfamiliar with; this strategy helps students reduce stress and anxiety that they may feel towards unfamiliar tasks or activities. The most effective priming is built into student routine, such as classroom procedure or instruction. The purpose of priming is not to teach, but rather familiarize students (Texas Statewide Leadership for Autism, 2013).

My behavior and interactions affects my instructional approaches and students' willingness to participate. It is important to have good rapport with the students, where a supportive relationship is established among the students and teacher. When students are comfortable, they feel less stress. I worked with my Cooperating Mentor Teacher (CMT) to discuss the classroom we wanted to shape and determine classroom rules and expectations. At the beginning of the second semester, I introduced to the students the mathematical and classroom norms, detailed in Table 4, that emphasize the SMPs. Norms are standards of behavior that are expected. These norms were introduced not as rules that are meant to be followed, but behaviors that are meant to be achieved. After going over what each norm means, the students agreed that the norms were reasonable and achievable.

Table 4 *Mathematical and Classroom Norms (Bostic, 2013)*

Mathematical Norms
<ul style="list-style-type: none"> • We will be ready for class and use our class time effectively. • We will be respectful of each other's time and space and work efficiently.

- We will actively participate by (a) listening to each other, (b) giving others our attention, (c) not speaking when someone else is talking, and (d) regularly sharing our ideas in class.
- If we disagree with someone or are unclear, we will ask a question about his or her idea and describe why we disagree or are confused.
- We will ask questions when we do not understand something.
- We will comment on others' ideas rather than the person.

Classroom Norms

- We will always look for another approach to solve problems.
- We will use pictures, graphs, tables, symbols, numbers, manipulatives, and words to assist us while doing mathematics.
- We will persist with every problem and examine it from multiple perspectives.
- We will be mathematically precise whenever possible.
- We will justify our mathematics work whenever possible.

These norms were put into place to support a classroom environment where students are able to achieve the SMPs. While the alternative assessments were meant to assess student content knowledge, they also focused on the SMPs. Therefore, these norms helped students have a greater sense of awareness of the SMPs and further prepared them to implement those behaviors in the alternative assessments. At first, as norms were encouraged in the lessons and classroom interactions, students were unconfident and anxious. However, with priming and positive reinforcement, students became comfortable and less stressed. When students shared an alternative way to solve a problem, I praised the students' idea. When students continued working a problem when it was frustrating, I congratulated them for their efforts.

About two to three times per week, we would have a challenge question at the beginning of the period. Students would work on this challenge question individually. After an appropriate amount of work time, pending on my observations of all students' work, I selected a student by randomly pulling a popsicle stick and asked them to come up to the Document Camera to share their work, whether it was done or not. Students would explain their procedure and reasoning. With students who were nervous, I initiated their explanation with prompting questions. Some of these prompted questions were as follows: what did you do to solve the problem? and why did

you do this procedure? I also prompted students for why they chose that process when they simply shared their procedure without an explanation. After students were finished explaining, I asked the class if they had any questions. After questions, the class would give the student the short appreciation clap. I would continue to select students to share and facilitate discussion until the challenge question was thoroughly addressed. After a few weeks of this style of sharing for the challenge questions, students were familiar and more comfortable with explaining themselves verbally.

Procedure

My action research project took place during my spring 2015 student teaching. Unfortunately, scheduling constraints due to PARCC testing led my action research project to a learning segment on simple interest, which is not necessarily mathematics that lends itself to a visual approach. This learning segment focused on how to calculate simple interest by identifying and applying the rate, time, and principle in the equation, $I=PRT$ to word problems. The scheduling constraints also limited the amount of time I was able to allot to this learning segment. Therefore, I was only able to offer the interview as an alternative assessment. I created a safe and comfortable classroom environment where students were willing to participate in completing an alternative assessment. I facilitated establishing this environment by having the class learn as a whole how to complete this type of assessment; students were able to reason and make sense of this method with their peers' assistance. I explained to the students that their course grade is not in jeopardy by taking an alternative assessment. Students have the opportunity to take the traditional test if they are not satisfied with their scores or performance.

I incorporated teaching students about these different assessments and how to complete them into my instructional approaches for the unit. During the lessons, I incorporated group

work where students were able to explain their thinking and procedure to each other. During the challenge problem, students were instructed to work individually on completing the challenge problem. Instead of having one student come up and explain to the class, each student explained to another student his or her reasoning and work. These primary strategies helped give students a chance to express their thinking verbally and practice applying and incorporating the vocabulary words of simple interest into their explanations.

The final assessment took place at the end of the unit. The traditional assessment is modeled after the CMT's past assessments and classroom worksheets and homework. The questions focused on procedural understanding and application of the simple interest to word problems. The evaluation criteria centered on students showing his or her work in the format I outlined class, which covered identifying the principal, rate, and time variables of the simple interest scenario in order to find the interest. The interview is a "think aloud" version of the traditional assessment, focusing on students explaining their thinking process when solving and persevering in the problems. The evaluation criteria centered on vocalizing their work and the reasoning behind their mathematical variable identifications and conversions. For the traditional assessment, the last question was a chart simulating compound interest, where students calculated the simple interest for each year. For the interview assessment, instead of calculating, students were asked how they would find the balance for year four and to describe their procedure.

The interviews were conducted by me on or around the same day students took the traditional assessment. Out of the 11 students in the class, six students (five female and one male) chose the interview assessment. These particular students are the higher-achieving students in the class, who excel in the math class. Students were given the traditional assessment

in order to write down their calculations; students were then instructed that their score was derived from what they spoke aloud and not necessarily what they wrote down. I recorded the interviews and took observational notes. After the assessment, students answered three open-response questions about why they chose the particular assessment: (1) Why did you pick the assessment?; (2) How did you feel about the assessment?; (3) Do you think the assessment accurately measured your understanding of simple interest? The interview times ranged from 17 minutes to 35 minutes. At the end of each interview, students were given the opportunity to go back and add to any problem. Some students took advantage of this opportunity and completed unfinished questions; however, most students declined.

Data Collection and Analysis

Data sets were collected through audio recording. Recordings were not transcribed because I felt close to the data after listening to them multiple times. I transcribed quotes as needed. As I listened to the recordings, I made memos of initial impressions, including a time stamp. After listening to all the recordings, I reviewed the initial impressions and looked for consistency across the memos. I condensed and grouped the memos into overarching impressions. I looked for evidence as well as non-evidence to support the overarching impressions; my overarching impressions were a consistent indication of the benefits of oral assessments. Once I felt overarching impressions were sound and well-supported, I retained them as themes. I listened to the recordings once again with these themes in mind I felt confident that my themes were fair representations of the data. The results are drawn from the data.

Results

There are two themes that arose from using the interviews as alternative assessments and they both revolve around the benefits of verbalizing mathematics. The first is that students who explain their thinking share greater understanding and depth of thinking. They are truly thinking through what they know, understanding their knowledge of the concept, and forming explanations for the problem. While the interview assessment was structured to be think-aloud – where the focus was hearing students’ mental process – students were careful of what they said and clearly took the time to think internally before speaking. On each recording, there were significant gaps where they were calculating and processing mentally. When I prompted and encouraged them to share their thinking as they worked, they would do so nervously. I hypothesize that this is due to the uncommon request of talking through the problem on an assessment, when they are typically told to be quiet. As one student pointed out in the middle of the interview, “I have to think before I speak. [That’s] kind of what [teachers] teach you: think before you do.” This same student expressed that it was difficult to think and speak at the same time. Another student similarly expressed that it was harder to explain how to do the work. This indicates the “extra” thinking that students did in order to respond to the interview questions. Typically on a traditional, mathematics assessments, students write down their procedures to find an answer and move on. However, these students wrote down their procedure to find an answer and then processed what they did, how they did it, and whether their answer makes sense.

A second theme is that interviews present opportunities for educators to learn about a students’ self-awareness of his/her understanding. For instance, there was a trend of students catching their mistakes on the third question when they explained their reasoning with work to back them up. After showing their work and calculating their answer for the third question, the

students needed to choose which bank they would like based on their calculations of the total savings. In the middle of their explanations, three students in particular interrupted themselves once they recognized they made a mistake. They would go back, fix their error, explain their error as they fixed it, and then continue with their explanation. One student in particular remarked that while she does not like talking in general, she liked talking through the quiz otherwise she “would not have caught [herself].” By verbalizing their explanations, they were more aware of what they were explaining.

Discussion

The assessment principle emphasizes that assessments need to assess students’ process of mathematical tasks and procedures, not simply their procedural and conceptual understanding (NCTM, 2000). By assessing students’ verbal explanations, the students spent more time thinking about what to say. This “extra” thinking supports the concept that we want to be assessing students on more than just procedural fluency. They demonstrated deeper learning by analyzing the mathematics procedures they did and formulating explanations. These students demonstrated mathematical reasoning skills when recognizing their mistakes and correcting their work and answers. After hearing their thought process, I can firmly say that the students who took the interview option were well-rounded in their knowledge of simple interest – not just procedural understanding. However, for the students who took the traditional assessment, I am unable to determine if they have a well-rounded understanding, due to the fact that the traditional assessment that I created only focused on their procedures.

Conclusion

This action research project opened my eyes to the benefits of alternative assessments. With the interview assessment, students exhibited a deeper understanding of simple interest by formulating explanations as well as utilizing mathematical reasoning. I learned that students need more opportunities to practice explaining their thinking. Despite the many opportunities to practice with challenge questions in class, students still took their time and were hesitant when explaining their thought process. If I were to do this action research project again, then I would spend more time priming the students to explain their thinking and helping students feel more comfortable. Students had the chance to practice and were given prompting questions, but we did not explicitly discuss how to effectively explain or what makes a sound explanation. In order to have students more engaged in their assessments, I would have students assess each other's explanations and then assess their own. By critiquing each other and themselves, they would be able to further develop their mathematical reasoning and have deeper understanding of the mathematical concept. I believe these strategies would better help them prepare and be more confident in their verbal abilities.

A noteworthy limitation of an interview assessment is how time-consuming they are to conduct. The students who took the traditional assessments completed the assessment in one class period. However, I was unable to conduct all the interview assessments within one class period. While my CMT monitored other periods taking the traditional assessment, I interviewed students during their respective study halls. I will not have the ability to leave my class to conduct interviews beyond student teaching. I only conduct this interview option with half of one class and it took a significant amount of time to conduct. It is difficult to imagine an

efficient way to facilitate this option for all of my classes. This would be my main reason for not offering an interview option as a summative assessment.

I believe oral assessments make for more convenient and effective formative assessments. They offer students a chance to develop their mathematical understanding and gain deeper learning – as opposed to the shallow learning of memorizing and recalling. My next step would be to discover and implement consistent, oral instructional strategies, beyond challenge questions, in order for students to be more familiar and feel more comfortable with expressing their thinking and reasoning verbally. The main instructional strategy I used to prime students was the explanations of challenge question answers. Students did not necessarily receive explicit feedback on their performance, but instead received prompting questions to help them further their explanations. I would like to explore students assessing each other and themselves. I believe this strategy will help students have a well-rounded perspective on oral explanations and be able to further master their skills. Also, I would like to focus on how to assist students individually with gaining confidence in explaining their thinking, especially students with emotional disturbances or anxiety towards speaking. By helping students individually, I would be able to cater to their areas of improvements and capitalize on their strengths.

Overall, I believe alternative assessments provide students with an opportunity to demonstrate their mathematical knowledge beyond procedures as well as provide teachers with an opportunity to assess students on their conceptual understanding and mathematical reasoning. In order for alternative assessments to be effective, students must be supported and primed through appropriate and purposeful instructional strategies.

References

- Adeyemi, A. Effect of Peer and Self-Assessment on Male and Female Students' Self-Efficacy and Self-Autonomy in the Learning of Mathematics. (2012). *Gender & Behaviour*, 10, 4492-4508.
- Bostic, J. (2013). Mathematics and Sociomathematical Norms. Retrieved from Lecture Notes Online.
- Gibbs, G. and Simpson, C. (2003). Measuring the response of students to assessment: the Assessment Experience Questionnaire [PDF document]. Retrieved from 11th Improving Student Learning Symposium online: https://www.uzh.ch/phil/elearning/ssl-dir/wiki/uploads/Main/Gibbs_and_Simpson_2003.pdf
- Iannone, P. P., & Simpson, A. A. (2012). Oral assessment in mathematics: implementation and outcomes. *Teaching Mathematics & Its Applications*, 31, 179-190.
- Joughin, G. (1998). Dimensions of Oral Assessment. *Assessment & Evaluation In Higher Education*, 23, 367.
- Kraftwohl, D. (2002) A revision of bloom's taxonomy: an overview. *Theory into Practice*, 41, 218.
- National Assessment of Educational Progress. (2003). Conceptual understanding. In *What Does the NAEP Mathematics Assessment Measure?* Retrieved from: <http://nces.ed.gov/nationsreportcard/mathematics/abilities.asp>
- National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston, VA; Author.
- National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards*. Washington, DC: Authors.

Simpson, N. J. (2004). Alternative assessment in a mathematics course. *New Directions For Teaching & Learning*, 100, 43-53.

Tarr, J. E., Berry III, R. Q., Walker, E. N., Rasmussen, C. L., Hollebrands, K. F., Konold, C., & ... King, K. (2013). New assessments for new standards: The potential transformation of mathematics education and its research implications. *Journal for Research in Mathematics Education*, 44, 340-352.

Texas Statewide Leadership for Autism. (2013). Priming. *Target: Texas Guide for Effective Teaching*, 1-2.

Williams, M. (2004). Concept mapping -- a strategy for assessment. *Nursing Standard*, 19(9), 33-38.