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Shape Shifting: The Impact of Student and Teacher Choice on Differentiation in a Detracked, Standards-Based High School Geometry Classroom

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Abstract

To gain insight into how using differentiated instruction and standards-based assessment supported my students' learning in a detracked, honors geometry classroom, I employed the methodology of practitioner research to examine and reflect on the development and implementation of a standards-based differentiated unit based on the Pythagorean Theorem. Data collected and analyzed included field notes during classroom activities, student artifacts from classroom assessments and activities, verbatim transcripts from audiotaped student interviews, and practitioner researcher journal entries chronicling significant events and actions taken during the development and implementation of the unit. As I reviewed, analyzed, and reflected upon the data, my findings indicated that allowing for both teacher and student choice for differentiation of homogeneous and heterogeneous grouping throughout the unit's implementation supported my struggling learners and challenged my advanced learners in my detracked Honors Geometry classroom.

The achievement gap, usually based on standardized test scores and graduation rates, highlights the differences between struggling and advanced students. This achievement gap can also be described as the 'opportunity gap,' as the inequities that exist both racially and economically in society mirror the same gap in achievement found in our schools (Carter, 2013; Welner & Carter, 2013).

Part of the opportunity gap that affects students in mathematics classes is ability tracking. In many schools, ability grouping for mathematics is a common practice, as many math teachers believe they can teach more effectively by narrowing the range and specificity of instruction for students whose knowledge is at the same level (Boaler, 2006). However, labeling students by ability level (low, regular, and advanced) creates artificial barriers within the learning environment that feed directly into the opportunity gap, and many students placed in lower tracks are faced with learning disparities that can affect their academic self-images and their motivation to excel (Bernhardt, 2014; Burris & Garrity, 2008; Chmielewski, Dumont, & Trautwein, 2013; Powell, 2011a; Quaglia, Fox, & Corso, 2010; Trautwein, Lüdtke, Marsh, Köller, & Baumert, 2006; Watanabe, 2012). Furthermore, ability tracking excludes lower-achieving students from meaningful peer-to-peer collaborative learning that teaches students the value of teamwork through modeling, interacting, and assistance from higher achieving students during problem-solving (Anderson, 2007; Cole, 2008; Morgan, 2014).

Teachers can take steps to reduce the opportunity gap by creating detracked, homogeneous learning environments so that all students can benefit from instruction from high-quality teachers in rigorous courses. Schools where teachers have the discretion to make decisions about the implementation and foci of their mathematics curricula and use specific structures in the classroom to assess their students' progress in mastering concepts have met with recent success in detracking mathematics (Horn, 2006). As teachers detrack mathematics classrooms, it becomes important for them to find ways to differentiate their instruction to effectively implement equity-based instruction and help their students focus on demonstrating proficiency and mastery of mathematics standards (Marzano, 2007; O'Connor, 2011; Stiggins & Chappuis, 2005).

Purpose and Research Question

In my local context, my concern is that many high school students homogeneously tracked into ability-grouped mathematics classes do not learn mathematics in equitable classroom environments or have access to identically rigorous curricula. Also, if students are placed into heterogeneously grouped mathematics classrooms, the curriculum and teaching strategies might not meet the needs of struggling students in their current learning environment (Burris & Garrity, 2008; Burris, Wiley, Welner, & Murphy, 2008; Powell, 2011a, 2011b).

With this concern, during the 2013-2014 academic year, I detracked the geometry courses I teach so that all students taking geometry were enrolled in Honors Geometry. The decision to enroll students in Honors Geometry ensured that each student had the chance to take the most rigorous geometry course offered, which removed a barrier for students who previously had not had the opportunity to take honors courses for various reasons. The data from the Geometry End-of-Course (EOC) exam, a statewide standardized test administered yearly to all geometry students, indicate that the detracking process was effective with a 96% passing rate for my geometry students, compared to the state's 64% passing rate (Florida Department of Education, 2013). However, after examining the data more closely, I noticed that students who performed at lower achievement levels were either black males or students who came from families with lower socioeconomic status. These data indicate that even with success for the majority of my students, the achievement, or opportunity gap, is still an issue within my detracked classroom. Moreover, although my advanced students meet the minimum level of proficiency on the mathematics standards for geometry, I felt as though I did not provide opportunities for a deeper understanding and application of their knowledge.

Within my detracked geometry classroom, I wanted to provide additional support for my students who struggle to learn mathematics, as well as challenge

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my students who have advanced understandings of mathematics concepts. Differentiated instruction offers promise to achieve these goals through developing and using varying methods and materials to reach all students. Differentiated instruction can enable struggling students to grasp concepts more effectively, motivate them to participate and engage in meaningful dialogue, and keep them from falling behind their peers, as well as push advanced learners to increase their knowledge and skills in areas explicitly connected to the standards (Burris & Garrity, 2008; Chapman & King, 2014; Ferlazzo, 2013).

Using differentiated instructional methods to deliver content that builds on students' critical thinking and problem-solving skills and elicits student discussions and explanations of solutions increases student achievement in mathematics classrooms (Schoen, Cebulla, Finn, & Fi, 2003). Hence, I wished to develop and implement a standards-based differentiated instructional unit of study in my detracked geometry classroom, and the research question that guided my study was:

> In what ways does differentiated instruction and standards-based assessment support struggling students and challenge advanced learners in a detracked Honors Geometry classroom?

This paper focuses on the planning and implementation of a differentiated and standards-based unit of study, as standards-based assessment begins with careful and conscientious planning and instruction. For more about the use of standards-based assessment, see Weller (2016).

Review of Literature

Dana (2013) notes the importance of using literature to inform the study of your own practice as a teacher researcher sharing that "when teachers inquire, their work is situated within a large, rich, preexisting knowledge base that is captured in such things as books, journal articles, newspaper articles, conference papers, and websites" (p. 33). Hence, I analyzed what has been written and published related to my topics of study to draw "relationships between the knowledge and the theory produced by others" and the knowledge teacher researchers are "generating locally from practice" (Dana, 2013, p. 34).

Differentiated Instruction

Teachers use differentiated instruction to adjust the content, process, or product of teaching and/or learning to maximize their students' ability to learn and apply knowledge. Teachers may differentiate the content of their lessons by adjusting what they plan to teach or altering how their students acquire the required knowledge, understanding, and skills (Anderson, 2007; Lewis & Batts, 2005). Teachers respond to the diverse needs of both their struggling and advanced learners by differentiating the depth of content that students explore related to the required standards for that subject (McTighe & Brown, 2005).

Teachers may also differentiate the process of teaching by analyzing their students' varying methods for understanding and assimilating facts, concepts, or skills and using the information to plan the activities they use in their classrooms based on their students' readiness to learn, interests, preferences, strengths, and needs (Anderson, 2007; Lewis & Batts, 2005; Rock, Gregg, Ellis & Gable, 2008; Watts-Taffe, Laster, Broach, Marinak, McDonald Connor & Walker-Dalhouse, 2012). Modifying how students work together is an important aspect of differentiated instruction, as students have more opportunities for success if given choices to work in learning environments that are conducive to their unique learning preferences (Anderson, 2007; Lewis & Batts, 2005; Morgan, 2014; Rock et al., 2008; Tomlinson, 2000, 2008).

Teachers can differentiate the product of student learning by using a variety of effective assessments that help drive their instruction and provide learning targets for their students to reach (Anderson, 2007; Rock et al., 2008; Stiggins, Arter, Chappuis & Chappuis, 2006; Wormeli, 2006). Effective informal and formal assessments are valid, reliable, and instructionally useful in evaluating what students know and do not know, and they help teachers and students make action plans for future learning (Stiggins et al., 2006; Watts-Taffe et al., 2012). Lawrence-Brown (2004) and Lewis and Batts (2005) suggest that teachers should avoid creating fixed groups with which to work, especially if they are based on ability, as doing so might result in tracking within their classrooms, creating problems associated with having lower expectations for struggling students. Instead, teachers should use formative assessments and student self-assessments during instruction to evaluate students' understanding of the content and adapt or modify their lessons or activities based on students' needs or instructional situations, which may vary from lesson to lesson, even for individual students (Lawrence-Brown, 2004; Rock et al., 2008; Stiggins et al., 2006; Tomlinson, 2008; Watts-Taffe et al., 2012).

Standards-Based Assessment

The purpose of standards-based assessment is to "compare student performance to established levels of proficiency in knowledge, understanding,

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and skills" (McMillan, 2009, p. 108) using a system that is based on specific learning targets and performance standards known to all teachers, students, parents, and other stakeholders (O'Connor, 2007; Tierney, Simon, & Charland, 2011). The intention of standards-based assessment is to provide information about the students' academic achievement that reflects the students' mastery of the curriculum objectives and learning standards for that course (Tierney et al., 2011). Guskey and Bailey (2001) and Stiggins et al. (2006) suggest that educators should first identify the major learning targets or standards that they expect their students to learn in their courses. Most teachers use their state's performance standards to identify their prescribed subject-specific goals (Harris, 2012). When teachers know the goals and objectives on which they will assess their students, they use them as a guide when planning differentiated units of study that help their students explore the concepts more deeply (Harris, 2012; Welsh, D'Agostino, & Kaniskan, 2013).

While planning for instruction based on specific standards for their students, teachers define the graduated levels of performance on which their students are assessed for each learning target (Guskey & Bailey, 2001; Welsh et al., 2013). These levels of performance are often illustrated and explained to students in the form of rubrics (McMillan, 2009; Reeves, 2011). These rubrics enable teachers to provide specific feedback to their students about their progress toward mastering the established learning goals and guide collaborative conversations between teachers and students for improving students' learning (Guskey & Jung, 2013; Reeves, 2011). As students self-evaluate and identify the areas in which they succeed and struggle, they develop a sense of ownership and responsibility toward learning (Guskey & Jung, 2013; McMillan, 2009).

Methodology

In order to design and teach a unit of instruction using differentiated instruction and standards-based assessment to support my Honors Geometry students' mastery of mathematics content standards, I engaged in practitioner research to better understand and meet the needs of my struggling and advanced students. Teacher inquiry is a systematic and intentional research approach I used to study my own practice and foster intellectual professional discourse with my colleagues through the collection, analysis, and interpretation of data (Campbell, 2013; Cochran-Smith & Lytle, 2009; Dana, Thomas, & Boynton, 2011; Dana & Yendol-Hoppey, 2009). As a practitioner inquirer, I purposefully collected and analyzed data to make determinations about my practice in order to improve my students' academic success (Campbell, 2013).

To gain insight into the ways differentiated instruction and standards-based assessment support struggling students and challenge advanced learners in a detracked Honors Geometry classroom, I developed and implemented a standards-based differentiated unit of study based on the Pythagorean Theorem for students in my geometry class that included different activities to support the needs of the learners to meet proficiency based on the adopted geometry standards. During the implementation of the unit, I focused my gaze as a researcher on nine specific students (all names are pseudonyms) in one section of a heterogeneous, detracked Honors Geometry course that contained students of varying achievement levels. I identified five students who often struggled with understanding content and solving problems during previously taught units in Honors Geometry. Using differentiated instruction and standards-based assessment, I wanted to help these struggling students (Beth, Frank, Nancy, Susan, and Ursa) comprehend and apply the Pythagorean Theorem successfully to reach at least the minimum level of proficiency. I also identified four advanced learners in my Honors Geometry course who understood and mastered the content standards quickly and efficiently, as well as scoring very high on all of their assessments. I wanted to find ways to challenge these students (Jeff, Lisa, Tammy, and Victor) so that they could expand their basic understanding of the Pythagorean Theorem.

As I developed and implemented this unit, I systematically and intentionally collected data to determine how differentiated instruction and standards-based assessment supported the mathematics learning of my struggling students and advanced learners. The data were collected in four ways. First, I gathered documents and artifacts from each class meeting, including student artifacts showing differentiation and achievement toward mastery/proficiency of learning targets. Second, I wrote down my individual teacher observations during class time with the students in the form of field notes. I also periodically audio-recorded student conversations during class time and transcribed those recordings into my field notes. Next, I audio-recorded students' reflections to gain insight about their needs while implementing differentiated classroom instruction and activities. Finally, as a practitioner researcher, I systematically and intentionally studied my work through personal reflection in a journal to better understand and meet the needs of my struggling students and advanced learners.

Planning a Standards-Based Differentiated Unit of Study

I chose to design a unit based on the standards that focus on the Pythagorean Theorem and incorporating differentiated activities that meet the needs of my diverse learners. The first step to planning the unit was identifying

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the state standards that focused on the Pythagorean Theorem. Next, I rewrote the state standards as learning goals in student-friendly language so that the students would be able to understand what I expected them to master during this unit, and, subsequently, self-assess their own learning (O'Connor, 2011; Stiggins et al., 2006). I then divided the learning goals into daily learning targets, breaking down the content into smaller chunks so that the information would be easier for my students to process and use (Marzano & Brown, 2009). Student-friendly learning targets, also called shared learning targets, break down larger learning goals into smaller pieces that students can use to determine what they need to learn during a lesson or unit (Leahy, Lyon, Thompson & Wiliam, 2005).

I created scaffolded note pages for my students to use during the direct instruction of each section of the Pythagorean Theorem unit. The note pages provided a detailed outline, or scaffold, that the students follow and fill in during direct instruction of the lesson. These note pages helped students stay focused during direct instruction and provided an organizational structure for students who lack executive functioning skills.

Included in the note pages was a standards-based self-assessment for students to examine and track their understanding of the learning targets for each lesson. Before instruction began, I asked the students to rate their understanding of each learning target by putting a star on the proficiency scale that ranges from 0 to 4 (Table 1).

Table 1. Student self-assessment rating scale

Numerical rating	Descriptor
0 = No Idea!	I have never heard of this.
1 = Emerging	I need help with all of the concepts and problems.
2 = Partially Proficient	I know the simple concepts and problems.
3 = Proficient	I know all of the simple and complex concepts and problems.
4 = Advanced	I can go beyond what is taught in class and use the concepts for other problems.

After teaching each lesson, I asked the students to rate their understanding of the learning targets again using the same proficiency scale by marking with a checkmark during the second rating. The students could then see growth in their understanding of the learning targets after participating in the lesson, and they could identify the learning targets with which they still needed help. The students revisited the learning targets throughout the unit, using their proficiency scales to track their progress toward meeting or exceeding the learning targets that were derived from the state standards (Marzano, 2007; Sturgis, 2014). My goal was to have every student eventually self-assess at the proficient level (level 3) on every learning target by the end of the unit.

After completing the scaffolded notes and student self-assessments, I turned to developing each day's face-to-face teaching and learning activities for the Pythagorean Theorem unit, being mindful about differentiating my instruction to meet the needs of all of my students. As part of my lesson planning for the instruction of the mathematics standards for the whole class, I designed instructional activities to reinforce my students' understanding of the learning targets for each lesson. I wanted activities to help my struggling students comprehend the geometric concepts that lead to using the Pythagorean Theorem to solve problems beyond just memorizing and using the formula $a^2 + b^2 = c^2$. I also wanted to include activities that required my advanced learners to push their thinking and extend their understanding of the learning targets.

For some of the activities, I needed ways for my strugglers to visualize the math by using hands-on manipulatives. I designed activities for students to model relationships using items such as 1-inch color tiles, 3-dimensional cubes, and paper circles to help students envision and understand how to use the Pythagorean Theorem in varying problem-solving situations. Although I did not make any hands-on manipulatives for my advanced students, I considered their needs as I was planning the unit. For example, I chose more abstract problems related to the learning targets for them to solve in small groups to push these students beyond solving problems requiring only rudimentary use of the Pythagorean Theorem.

After creating the differentiated activities, the next part of my planning included deciding what kinds of standards-based formative assessments I wanted to use to determine my students' comprehension of the learning targets related to the Pythagorean Theorem. Daily formative assessments would help me determine which of my students were struggling with understanding the material and which were ready for more challenging work. I intended to use various forms of formative assessments throughout the unit, including my observations and conversations during individual and group work, students' ability to complete assignments in and out of class with accuracy, and individual paper-and-pencil formative assessments based on daily lessons and learning targets.

By first writing learning targets based on the state standards, creating scaffolded notes and student self-assessments, designing the instructional activities, and developing the formative assessments to use during instruction, I

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was able to design a detailed instructional unit aligned with specific goals for what I wanted my students to know and be able to do related to the Pythagorean Theorem (Stiggins et al., 2006; Tomlinson & Moon, 2013; Wiggins & McTighe, 2005). I then proceeded to implement this standards-based differentiated unit of study over a two-week period.

Data Analysis

Each day of the two-week Pythagorean Theorem unit, I carefully reviewed and formatively analyzed the data I collected in my field notes, student artifacts, student interviews, and entries made in my journal. According to Dana (2013), formative data analysis is an important component of practitioner inquiry as teacher researchers use data to “make decisions about instruction” (p. 50). After each instructional day, I formatively assessed what my students and I did through reflecting in my journal. I also used informal student observations, interviews, and conversations from the day as a type of formative assessment. I used the information from these formative assessments to determine any instructional or assessment changes I would need to make before the next day with the students, and these were noted in my practitioner researcher journal. The work and assessments that my students produced, as well as the results of the activities, were analyzed to determine if mastery of the learning targets related to the Pythagorean Theorem progressed at an acceptable rate, and to determine what interventions needed to take place for my struggling students or extended activities given to my advanced learners.

After I completed teaching the unit in its entirety, I next engaged in the process of summative data analysis. According to Dana (2013):

> While important insights are gleaned from the process of formative data analysis, as one nears the end of a cycle of inquiry, it’s critical to engage in summative data analysis as well. Summative data analysis involves stepping back at the end of one inquiry cycle and taking a look at the entire data set as a whole… New and different types of insights are gleaned from the independent looks at isolated portions of data done previously during formative data analysis. (p. 53)

In order to gain insight from the entire set of data, I assembled all of the data generated during the study in one location. I read through all of the data several times to understand the set as a whole before breaking it into parts (Agar, 1980). I sorted the data by student and placed them on posters I created for each struggling and advanced student that I had identified at the beginning of my study. I highlighted key concepts or ideas that emerged from the data, finding research stories that related back to my study's purpose (Creswell, 2013; Dana & Yendol-Hoppey, 2009). As engaging in practitioner inquiry requires critical reflection from both theory and practice, my data analysis included interpreting the stories found in my data and connecting that information to previous research and literature (Cochran-Smith & Lytle, 2009).

Findings

Three assertions based on summative data analysis emerged that focused on the significance of student and teacher choice for differentiation in a detracked, standards-based high school geometry class.

(1) Planning and implementing a differentiated and standards-based unit of instruction supported my struggling learners and challenged my advanced learners by allowing for both teacher and student choice for grouping throughout the unit's implementation.

(2) Using self-assessment provided an opportunity for both my struggling and advanced learners to be metacognitive about their own learning and determine their next steps for learning in the classroom.

(3) Not allowing students to choose their group placement caused frustration and disengagement in class.

Planning and implementing a differentiated and standards-based unit of instruction supported my struggling learners and challenged my advanced learners by allowing for both teacher and student choice for grouping throughout the unit's implementation.

Throughout the unit, homogeneous and heterogeneous student groups were created for different parts of each days' lessons. I define homogeneous grouping for the purposes of this study as the creation of two groups. The first group consists of learners with minimal to no knowledge of the learning target(s) for the lesson, while the second consists of learners who have basic knowledge of the learning target(s) for the lesson and are ready to deepen and enhance their understanding of the learning target(s).

During the implementation of the unit, homogeneous groups were formed by student choice after the completion of self-assessments following direct

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instruction on learning targets each day. This gave students who had rated themselves at a 1 or 2 the opportunity to work together to increase their understanding of the content, work with hands-on manipulatives, and receive further assistance to learn the concepts related to the learning targets. Students who had rated themselves at a 3 or 4 chose to solve challenging problems related to the learning targets, and had the chance to work together at a quicker pace without assistance. Homogeneous groups were created for review purposes at the end of the unit, and the students who rated themselves at a lower level of understanding worked together in small groups with teacher assistance, while students who had indicated they were at a higher level of understanding of the learning targets worked in their own groups without any extra help.

I define heterogeneous grouping for the purposes of this study as the creation of groups that combine learners who had minimal to no knowledge of the learning target(s) for the previous day's lesson with learners who had basic to advanced knowledge of the learning target(s) for the previous day's lesson. I assigned students to heterogeneous groups using data from my formative assessments and the students' self-assessment ratings to review the assigned practice problems from previous days' lessons at the start of class each day and during different review activities and games near the end of the unit prior to the summative assessment. For example, I reflected in my practitioner researcher journal about how I needed to deliberately organize each student group to have diverse learners so that, through peer instruction and conversation, both my struggling and advanced learners increased their understanding of the learning targets.

Day 2: Ursa and Frank both talked about how they liked to work with other students who could explain how to work out the problems during their interviews. Although I see that homogeneous groups work well for helping my struggling students grasp the concepts better, I believe that peer interaction might provide more guidance for understanding the problem-solving associated with the standards. I am going to make heterogeneous groups for reviewing the learning targets from today using the students' self-assessments. I will put 2-3 students from the group that worked independently with 2-3 students from the group that needed more direct instruction in each group (PRJ, February 24, 2015, p. 1).

Using self-assessment provided an opportunity for both my struggling and advanced learners to be metacognitive about their own learning and determine their next steps for learning in the classroom.

When I reviewed the data, I found that both my struggling and advanced learners became more metacognitive about their own learning following the student self-assessments. They were able to determine whether they needed more direct instruction or assistance with understanding the learning targets or were ready to explore the concepts in more depth through problem-solving activities. All students had the power to choose whether they needed more instruction for mastering a particular learning target, and they took their learning into their own hands and became more cognizant of what they needed to be successful.

I noticed that the students who struggled with understanding the learning targets tended to rate themselves honestly, and most chose to participate in the homogeneous group that provided additional learning activities or direct instruction from me that increased that understanding. For example, Nancy, Ursa, and Frank mentioned a feeling of comfort in working with students with a similar understanding of the Pythagorean Theorem.

Nancy: I think that breaking us into groups helped me feel more comfortable with asking questions. Sometimes I get nervous asking questions when the people I'm working with already know what they're doing (SI 1, February 24, 2015, p. 1).

Ursa: It made me feel better knowing that more people didn't know as much like I did, and we did it together, and it was easier for me (SI 1, February 24, 2015, p. 2).

Frank: You helped us understand the Pythagorean Theorem better when you let us split into groups. The people who knew it didn't need extra help, so they were doing more of their own thing because they were at a higher understanding level. For the people who didn't know it, you focused more of your attention to us and it was more individualized and more specific to what we needed. I like how you split us into groups because I was able to ask more questions. I felt more comfortable asking questions (SI 1, February 24, 2015, p. 2).

There were rare occasions when the struggling students found themselves in situations that might have been too challenging for them, but they usually chose to stay in the groups in which they had placed themselves.

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Susan: I wanted to work with the other (advanced) group, because I thought I knew what I was doing after the notes. It was really hard, though. I probably should have moved back to the other group, but I didn't want to (SI 2, February 26, 2015, p. 1).

Many students who placed themselves in the advanced or independent groups for challenging activities shared that they would be comfortable choosing to be in the group receiving more instruction if they did not understand a learning target.

Jeff: If I'm not sure that I know the stuff that we are learning, I would rather sit through it just to make sure I'm not missing anything I need to know (SI 1, February 24, 2015, p. 1).

Tammy: If I didn't know what I was doing, I would want to be in the other group (SI 1, February 24, 2015, p. 1).

Indeed, after a lesson focused on circles and the Pythagorean Theorem, Tammy did select to be in the group that received more assistance in understanding circle equations, describing her thinking as follows:

Tammy: I did not rate myself very high on the self-assessment and went to the other group than I had been in before. I didn't feel strange doing that even though I usually work with the other group. I knew those people who are normally in the group that I'm in were going to go fast and beyond what you're supposed to know. And if I wasn't feeling completely comfortable with the topic yet I wasn't going to want to do that because I would confuse myself completely and I wouldn't grasp the basics of the concept I was trying to understand…I guess I just needed to talk my way through the problems to understand what to do. I know the circle equations after doing the activity and am comfortable solving problems with them (SI 3, February 27, 2015, p. 1).

Tammy's ability to choose her group and subsequent differentiated learning activity allowed her to achieve a level of success with understanding and mastering the learning target.

Not allowing students to choose their group placement caused frustration and disengagement in class.

My data indicated that some of my students became frustrated when I did not let them choose their group placement. When I used the pre-assessment to place students into homogeneous groups on the first day of the unit, I placed Victor in the direct-instruction group. I noted in my field notes that he seemed upset during instruction.

Day 1: Victor is quiet, flushed in face. Seems frustrated. Not engaging in activity (FN 1, February 23, 2015, p. 2).

When I interviewed Victor after class, he confirmed his feelings of frustration and not wanting to participate.

Victor: I was in the group in the front of the room with you because I messed up on the pre-test. After the first couple of minutes, I figured out what I did wrong and wanted to move because I was bored (SI 1, February 24, 2015, p. 2).

It was only after I reassured Victor that he would not have to remain in this group for the entire unit that he started to work and encourage others to participate. Knowing that he would be able to change his placement increased his engagement in class. Hence, one reason both teacher and student choice in group placement played a critical role in how differentiated instruction and standards-based assessment supported the learning of my struggling and advanced learners was that homogeneous groups were not defined by a student's fixed ability and did not remain stagnant for the unit's duration. Rather, groups were defined by students' proficiency in meeting specific learning targets for the unit and were fluid and flexible, with students changing to different groups throughout the unit based on their own self-assessments and performance on formative assessments. Teacher-formed and student-selected groups worked in concert to ensure students were receiving what they perceived they needed to be successful in meeting learning targets.

Summary and Conclusions

In sum, as I implemented a standards-based differentiated unit of study based on the Pythagorean Theorem, I recorded classroom observations in my field notes, reflected daily in my practitioner researcher journal, and recorded student reflections about the process during interviews. These data indicate that the learning of both my struggling and advanced students was supported by allowing

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for both teacher and student choice for grouping throughout the implementation of the unit. Providing opportunities to participate in differentiated instructional activities in various types of group settings was advantageous for both my struggling and advanced learners. Teacher and student choice for creating those groups contributed to students' being more comfortable to ask questions and led to their becoming more metacognitive. The combination of teacher and student choice with the fluid and flexible group structure also contributed to students' finding the learning environment that was most conducive to their mastery of the standards-based learning targets.

Implications

According to Dana & Yendol-Hoppey (2014), at the end of each cycle of inquiry, it is important to reflect on one's learning as a teacher researcher to articulate the implications of one's work. My study provided insights into the ways planning and implementing a differentiated and standards-based unit of study based on the Pythagorean Theorem supported both my struggling and advanced learners within my detracked classroom. A lesson I learned that has implications for my teaching is that I need to take into consideration the diverse needs of all of my students and their different levels of learning within my detracked classroom. Essential in planning and implementing units of study is identifying areas in the lessons where a lack of prerequisite skills might impede student understanding or places where common misconceptions might occur that confuse student comprehension, and then providing concrete representations of abstract concepts for students who struggle with the learning targets. I also must be ready with activities for my advanced students that challenge or extend their knowledge of the content. Additionally, I must assess constantly, and in different ways, to gain insight into my students' understanding of the learning targets so that I can create targeted practice or extension activities for homogeneous and heterogeneous student groups (Laud, 2011).

Being attentive to students' needs and having flexibility in finding ways to meet those needs is key to teaching in a detracked classroom, because the varying range of student abilities requires different teaching techniques at different times. Encouraging my students to reflect on what they know and do not know in order to recognize and choose what they need to increase their own understanding of a unit's learning targets is essential. O'Connor (2011) suggests that when teachers help their students identify their strengths and areas needing improvement, they give them the tools for setting goals and monitoring their progress in learning. I saw my students become more engaged in their learning by choosing learning activities that met their needs, leading to more accountability and a heightened level of ownership and responsibility for their learning.

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References

Agar, M. H. (1980). *The professional stranger: An informal introduction to ethnography*. San Diego: Academic Press.

Anderson, K. M. (2007). Differentiating instruction to include all students. *Preventing School Failure, 51*(3), 49-54.

Bernhardt, P. E. (2014). Making decisions about academic trajectories: A qualitative study of teachers' course recommendation practices. *American Secondary Education, 42*(2), 33-50.

Boaler, J. (2006). How a detracked mathematics approach promoted respect, responsibility, and high achievement. *Theory into Practice, 45*(1), 40-46.

Burris, C. C. & Garrity, D. T. (2008). *Detracking for excellence and equity*. Alexandria, VA: Association for Supervision and Curriculum Development.

Burris, C. C., Wiley, E., Welner, K., & Murphy, J. (2008). Accountability, rigor, and detracking: Achievement effects of embracing a challenging curriculum as a universal good for all students. *Teachers College Record, 110*(3), 571-608.

Campbell, K. (2013). A call to action: Why we need more practitioner research. *Democracy & Education, 21*(2), 1-8.

Carter, P. L. (2013). Student and school cultures and the opportunity gap: Paying attention to academic engagement and achievement. In P. Carter & K. Welner (Eds.), *Closing the opportunity gap: What America must do to give every child an even chance* (pp. 143-155). New York: Oxford University Press.

Chapman, C., & King, R. (2014). *Planning and organizing standards-based differentiated instruction*. (2nd ed.). Thousand Oaks, CA: Corwin.

Chmielewski, A. K., Dumont, H., & Trautwein, U. (2013). Tracking effects depend on tracking type: An international comparison of students' mathematics self-concept. *American Educational Research Journal, 50*(5), 925-957. doi: 10.3102/0002831213489843

Cochran-Smith, M., & Lytle, S. (2009). *Inquiry as stance: Practitioner research* *for the next generation*. New York: Teachers College Press.

Cole, R. W. (2008). *Educating everybody's children: Diverse teaching strategies for diverse learners* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Dana, N. F. (2013). *Digging deeper into action research: A teacher inquirer's field guide.* Thousand Oaks, CA: Corwin Press.

Dana, N. F., Thomas, C. H., & Boynton, S. (2011). *Inquiry: A districtwide approach to staff and student learning*. Thousand Oaks, CA: Corwin.

Dana, N. F., & Yendol-Hoppey, D. (2009). *The reflective educator's guide to classroom research: Learning to teach and teaching to learn through practitioner inquiry*. (2nd ed.). Thousand Oaks, CA: Corwin Press.

Dana, N. F., & Yendol-Hoppey, D. (2014). *The reflective educator's guide to classroom research: Learning to teach and teaching to learn through practitioner inquiry*. (3rd ed.). Thousand Oaks, CA: Corwin.

Ferlazzo, L. (2013). *Self-driven learning: Teaching strategies for student motivation*. Larchmont, NY: Eye on Education, Inc.

Florida Department of Education. (2013). *Geometry end-of-course assessment state report of districts, spring administration, 2013*. Retrieved from http://www.fldoe.org/accountability/assessments/k-12-student-assessment/results/2013.stml

Guskey, T. R., & Bailey, J. M. (2001). *Developing grading and reporting systems for student learning*. Thousand Oaks, CA: Corwin Press.

Guskey, T. R., & Jung, L. A. (2013). *Answers to essential questions about standards, assessments, grading, and reporting*. Thousand Oaks, CA: Corwin.

Harris, D. M. (2012). Varying teacher expectations and standards: Curriculum differentiation in the age of standards-based reform. *Education and Urban Society*, *44*(2), 128-150. doi: 10.1177/0013124511431568

Horn, I. S. (2006). Lessons learned from detracked mathematics departments. *Theory Into Practice*, *45*(1), 72-81.

DOI: <p>http://doi.org/10.5038/2379-9951.2.2.1041</p>

Laud, L. (2011). *Using formative assessment to differentiate mathematics instruction, grades 4-10: Seven practices to maximize learning*. Thousand Oaks, CA: Corwin.

Lawrence-Brown, D. (2004). Differentiated instruction: Inclusive strategies for standards-based learning that benefit the whole class. *American Secondary Education*, *32*(3), 34-62.

Leahy, S., Lyon, C., Thompson, M., & Wiliam, D. (2005). Classroom assessment minute by minute, day by day. *Educational Leadership*, *63*(3), 18-24.

Lewis, S. G., & Batts, K. (2005). How to implement differentiated instruction? Adjust, adjust, adjust. *Journal of Staff Development*, *26*(4), 26-31.

Marzano, R. J. (2007). Designing a comprehensive approach to classroom assessment. In D. Reeves (Ed.), *Ahead of the curve: The power of assessment to transform teaching and learning (pp. 103-125).* Bloomington, IN: Solution Tree Press.

Marzano, R., & Brown, J. (2009). *A handbook for the art and science of teaching*. Alexandria, VA: Association for Supervision and Curriculum Development.

McMillan, J. H. (2009). Synthesis of issues and implications for practice. In T. Guskey (Ed.), *Practical solutions for serious problems in standards-based grading.* Thousand Oaks, CA: Corwin Press.

McTighe, J., & Brown, J. L. (2005). Differentiated instruction and educational standards: Is detente possible? *Theory Into Practice*, *44*(3), 234-244.

Morgan, H. (2014). Maximizing student success with differentiated learning. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas. 87*(1), 34-38. doi: 10.1080/00098655.2013.832130

O’Connor, K. (2007). The last frontier: Tackling the grading dilemma. In D. Reeves (Ed.), *Ahead of the curve: The power of assessment to transform teaching and learning (pp. 127-145).* Bloomington, IN: Solution Tree Press.

O'Connor, K. (2011). *A repair kit for grading: 15 fixes for broken grades, 2nd Ed.* Boston, MA: Pearson Education, Inc.

Powell, R. (2011a). Introduction. In R. Powell & E. Rightmyer (Eds.), *Literacy for all students: An instructional framework for closing the gap* (pp. 1-10). New York: Routledge.

Powell, R. (2011b). Classroom climate/physical environment: Creating an inclusive community. In R. Powell & E. Rightmyer (Eds.), *Literacy for all students: An instructional framework for closing the gap* (pp. 35-56). New York: Routledge.

Quaglia, R. J., Fox, K. M., & Corso, M. J. (2010). Got opportunity? *Educational Leadership*, *68*(3). Retrieved from http://www.ascd.org/publications/educational-leadership/nov10/vol68/num03/Got-Opportunity¢.aspx

Reeves, D. (2011). *Elements of grading: A guide to effective practice*. Bloomington, IN: Solution Tree Press.

Rock, M. L., Gregg, M., Ellis, E., & Gable, R. A. (2008). REACH: A framework for differentiating classroom instruction. *Preventing School Failure*, *52*(2), 31-47.

Schoen, H. L., Cebulla, K. J., Finn, K. F., & Fi, C. (2003). Teacher variables that relate to student achievement when using a standards-based curriculum. *Journal for Research in Mathematics Education*, *34*(3), 228-259.

Stiggins, R., & Chappuis, J. (2005). Using student-involved classroom assessment to close achievement gaps. *Theory Into Practice*, *44*(1), 11-18.

Stiggins, R. J., Arter, J. A., Chappuis, J., & Chappuis, S. (2006). *Classroom assessment for student learning: Doing it right-using it well*. Portland, OR: Educational Testing Service.

Sturgis, C. (2014). *Progress and proficiency: Redesigning grading for competency education*. Retrieved from http://www.competencyworks.org/wp-content/uploads/2014/01/CW-Progress-and-Proficiency-January-2014.pdf

Tierney, R. D., Simon, M., & Charland, J. (2011). Being fair: Teachers' interpretations of principles for standards-based grading. *The Educational Forum*, *75*, 210-227. doi: 10.1080/00131725.2011.577669

Tomlinson, C. A. (2000). Reconcilable differences? Standards-based teaching and differentiation. *Educational Leadership*, *58*(1), 6-11.

Tomlinson, C. A. (2008). The goals of differentiation. *Educational Leadership*, *66*(3), 26-30.

Tomlinson, C. A. & Moon, T. R. (2013). *Assessment and student success in a differentiated classroom*. Alexandria, VA: Association for Supervision and Curriculum Development.

Trautwein, U., Lüdtke, O., Marsh, H. W., Köller, O., & Baumert, J. (2006). Tracking, grading, and student motivation: Using group composition and status to predict self-concept and interest in ninth-grade mathematics. *Journal of Educational Psychology*, *98*(4), 788-806. doi: 10.1037/0022-0663.98.4.788

Watanabe, M. (2012). *"Heterogeneous" classrooms: Detracking math and science: A look at groupwork in action*. New York: Teachers College Press.

Watts-Taffe, S., Laster, B. P., Broach, L., Marinak, B. A., McDonald Connor, C., & Walker-Dalhouse, D. (2012). Differentiated instruction: Making informed teacher decisions. *The Reading Teacher*, *66*(4), 303-314. doi: 10.1002/TRTR.01126

Weller, K. N. (2016). *The role of differentiation and standards-based assessment in the mathematics learning of struggling and advanced learners in a detracked high school geometry classroom* (Doctoral dissertation, University of Florida, 2016). Retrieved from http://search.proquest.com/docview/1849003629

Welner, K. G., & Carter, P. L. (2013). Achievement gaps arise from opportunity gaps. In P. Carter & K. Welner (Eds.), *Closing the opportunity gap: What America must do to give every child an even chance* (pp. 1-10). New York: Oxford University Press.

Welsh, M. E., D'Agostino, J. V., & Kaniskan, B. (2013). Grading as a reform effort: Do standards-based grades converge with test scores? *Educational Measurement: Issues and Practice*, *32*(2), 26-36.

Wiggins, G., & McTighe, J. (2005). *Understanding by design* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

Wormeli, R. (2006). *Fair isn't always equal: Assessing and grading in the differentiated classroom*. Portland: Stenhouse Publishers.

DOI: <p>http://doi.org/10.5038/2379-9951.2.2.1041</p>