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Practicum Proposal
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Chapter 1 – Introduction

As a secondary mathematics teacher, I have had the joy of teaching Algebra at least part of every school year. Algebra I is the content area in which I am the most experience and I have additional experience teaching a lower level Algebra concepts course as well as upper level Algebra. Teaching these additional courses helps me understand where students need to be when they enter Algebra I class as well as the most important concepts they should master in order to be successful in future math courses. Being a part of the team that will revise and integrate the Algebra I curriculum in the Omaha Public Schools is important to me because I have a great deal of experience and can contribute to refining the curriculum so it is most effective. In addition, I will aid in implementing this newly revised curriculum across the district and assist any teachers with gaining additional resources they need to teach the units.

The Omaha Public School system contains eleven middle schools, seven high schools, three alternative program secondary schools as well as independent study opportunities. All of these schools will implement the Algebra curriculum we write. The main team consists of me, two other high school teachers and one middle school teacher.

Chapter 2 – Setting

Omaha Public Schools has recently implemented the use of Standards Based Grading. This grading system has created a need for big ideas, common assessments and complete alignment with a new grading scale. Any change this drastic in a district this size is met with some hesitation and frustration by teachers and parents alike. It becomes increasingly important that we write and teach a curriculum that easily aligns with the standards and grading scale and is centered on the important concepts that students must master.

I have experience writing curriculum from scratch in my previous district and can use this experience to make changes that conform to Standards Based Grading. I also have a leadership style that allows me to listen to others' concerns and dispel any misunderstandings with solid information and reassurance. It is not only my role to assist in writing the curriculum but also to introduce the changes to the teachers district-wide.

Chapter 3 – Research and Literature Review

When preparing to update curriculum for the 2012-2012 school year, it is important to implement current best practices for teaching Algebra. In addition, it is necessary to see and understand the validity of Algebra in school and the world today. In the Omaha Public Schools, our curriculum must align with Standards Based Grading (SBG) so a clear definition of SBG must be obtained. My research

followed these essential questions and covers the following topics: What is Standards Based Grading and why is it useful? Why Algebra is important to today's student. What are the current best practices for teaching Algebra?

Standards Based Grading first and foremost calls for "district-wide common assessments, curricular pacing charts, data-based collaboration meetings and daily tutorials" (Cox, 2011) if implemented effectively. SBG is a system that grades students only on mastery of concepts and nothing else. It is supposed to "measure students' proficiency on well-defined course objectives" (Scriffiny, 2008). It avoids point values that appear in traditional percentage-based systems and assigns grades based on levels of proficiency instead of work-habits and citizenship. Marzano and Heflebower point out that SBG allows for teachers to assess students even if they are unaware they are being assessed and students have multiple opportunities to increase their proficiency levels (2011).

In the Omaha Public Schools, implementation of SBG has been met with some resistance. While teachers must grade on the standards based scale, not all teachers are following the leveled work requirements or giving retake opportunities. It is important when writing curriculum that the assessments are completely aligned with the standards based scale and that teachers have multiple options for offering alternative assessments and retakes.

Statistics alone could illustrate the need for a strong Algebra I curriculum. A 2005 study found that "more than 80 percent of students who took Algebra I as 9th graders went on to complete Algebra II or an advanced math class such as calculus, during high school" (Cavanagh, 2008). The National Mathematics Advisory Panel's research shows that "if students do well in Algebra I, then they are more likely to succeed in college and be ready for better career opportunities in the global economy of the 21st century" (Vogel, 2008). Vogel also cites a 2006 study at Florida International University that found that students who failed Algebra I were "four times more likely to drop out of high school than those who pass the course." A 2010 survey of 22 postsecondary math instructors found that "nearly all considered algebra a very important prerequisite for college-level math. Unfortunately, the respondents rated incoming undergraduates' knowledge of various algebraic topics as 'poor' or 'very poor'" (Oishi, 2011).

Aside from the statistics, Algebra brings more than just the applying quadratic formula to the table. Algebra "opens the door to all high school math." Algebra I is the first math class that "requires abstract thinking and problem solving skills that are invaluable even if a student never uses algebraic standards" (Vogel, 2008). Algebra "helps people solve problems that require them to consider several quantities that depend on each other." Additionally, a person will be "more likely to make unwise decisions, and find [them] selves with less control over their life than others who have this knowledge" (Cavanagh, 2008). Oishi argues that the "foundational cognitive skills [in algebra] are necessary for success not only in school but also in higher education and the modern job market" (2011).

It is vital that a strong Algebra curriculum is written to support this stepping stone for students. We must ensure that students and teachers are given the necessary tools before, during and after

taking/teaching the course. The Omaha Public Schools must ensure that, while algebra is mandated for all students, students are not prematurely enrolled in the course. We are writing a curriculum that supports both middle and high school algebra and aligns with the state standards of both. "Mandating algebra in 8th grade is the equivalent of mandating, by policy, that all buildings immediately erect a fiftieth floor – regardless of their current height" (Cavanagh, 2008(2)).

In order to create a curriculum that implements current best practices, such concepts must be on the forefront of our minds. When creating/revising the introductory unit for algebra, I will remain aware of the relationship between fraction proficiency and success in algebra. A study conducted at the University of Nevada concluded that "the subject of fractions is able to prepare student for the level of generalization that is necessary for understanding algebraic concepts." Additionally, it sited that "much of the content of elementary algebra and intermediate algebra depends on an understanding of fractional concepts and the ability to demonstrate that understanding when solving various algebraic equations" (Brown & Quinn, 2007). This study will remind us to implement a conceptual as well as procedural fraction review and to maintain the use of fractions throughout the year.

When revising the unit topics and the essential questions, we must keep in mind that we do not want our curriculum to look like "distinct strands with such subtopics such as patterning, data analysis, simple functions and coordinate systems" but rather we want to "extend learners' understanding of arithmetic and enable them to express arithmetical understandings as generalizations using variable notation" (Ketterlin-Geller, Jungjohann, Chard & Baker, 2007). We need to help teachers understand the necessity of teaching the conceptual understandings and not just procedures.

The use of multiple representations ties in easily with Standards Based Grading and is a great way for teachers to assess a student's level of understanding. Regina Panasuk argues that using multiple representations helps "to ascertain whether students are building conceptual understanding instead of efficiently repeating a process" (2010). She cited the multiple representations as numeric, verbal and pictorial/graphic. She goes on to say that information on what students know based on the multiple representations is "essential to planning instruction for naturally diverse population of students with wide range of abilities, learning preferences and attitudes."

There are many other ideas supporting current best practices. The impact of purposeful movement in Algebra classes is said to "increase student outcomes and attitudes" (Beaudoin & Johnston, 2011). Teaching students flexibility in problem solving is said to "increase procedural fluency" as well as link procedural knowledge closely with conceptual when students can easily switch between various solution methods (Newton, Star & Lynch, 2010). Foster argues that "graph drawing can help mathematics teachers to teach students about self-learning" when a teachers allows students to discover the effects of changing certain parts of an equation instead of the teacher demonstrating the changes (2011). All of these studies give great insight into what will be the best way to keep our students on the track to success when learning algebra.

Chapter 4 – Plan of Action

This summer and fall I will be working with three other math teachers to refine and update the Algebra I curriculum for the Omaha Public Schools. We are responsible for looking at the feedback already given by the teachers in the district at past curriculum days and changing the units to more closely align to the standards and fit into a reasonable pacing guide. Additionally, we are responsible for gathering teaching experiences that align with each unit in order to offer the teachers a well-rounded approach to instruction. Our revision will be supervised by the district math leaders Valerie Schovanek and Jim Harrington. The units of study must be ready for the start of the school year. We will implement the revised curriculum in the fall of 2012 with a rollout at the first curriculum day (before school starts). I will be presenting the changes to a group of secondary teachers from around the district at the curriculum day. I will be presenting at the follow-up curriculum days to the same group of teachers to hear feedback on the changes and answer any questions that may arise. The first follow-up curriculum day is September 28th. I will also be implementing the new curriculum into my own Algebra I classroom.

Annotated Bibliography

Beaudoin, C., & Johnston, P. (2011). The impact of purposeful movement in algebra instruction. *Education*, *132*(1), 82-96.

Beaudoin and Johnston conducted a study in Algebra II classes comparing students who learned from teacher lecture and students who learned from activities with purposeful movement. The students in the latter group's mean gain was about 19% higher from pretest to posttest. The authors also cited many other studies where purposeful movement and unrelated movement increase learning and retention. This article is a useful tool to keep in mind when planning lessons. Students are more likely to retain knowledge if allowed to move around a bit.

Brown, G., & Quinn, R. J. (2007). Investigatin the relationship between fraction proficiency and success in algebra. *Australian Mathematics Teacher*, *63*(4), 8-15.

Brown and Quinn explore the relationship between proficiency with fractions and success in algebra. They talk about not just the procedural ability to work with fractions but the understanding behind why fractions are manipulated this way. Their study concluded that without fraction proficiency students have a much harder time grasping the concepts of algebra. This is a good reminder for teachers that if a student has not mastered fractions it is not sufficient to hand them a calculator. Students must understand the reasoning behind fraction computation in order to extend that knowledge.

Cavanagh, S. (2008). Catching up on algebra. *Education Week*, *27*(34), 25-28.

In this article, Sean Cavanagh talks about many schools trying out unconventional methods to help students who struggle in algebra. He describes several specific teaching methods as well as their validity. Cavanagh's article is applicable to how we teach and why we teach this way. It is a good resource for teachers of math at any level.

Cavanagh, S. (2008). Low performers found unready to take algebra. *Education Week*, *28*(5), 1-13.

In this article Cavanagh discusses the excessive enrollment of students in algebra who are not ready. He talks about students well below grade level who are enrolled in algebra in 8th grade. He also talks about the need for strong algebra curriculum that is standards based and not watered down but that enlists the right students. This article is good for a middle school teacher to refer to when questioning a student's readiness for algebra. It would help defend a teacher's hesitation in enrolling all 8th graders in this advanced class.

Cox, K. B. (2011). Putting classroom grading on the table: A reform in progress. *American Secondary Education*, *40*(1), 67-87.

This is a case study of the outcome of the shift to Standards Based Grading in one specific school district. It describes the components of SBG as well as many positive changes that were made. This is a good resource for teachers of the Omaha Public Schools to see what negative effects change-resistant teachers can have on a system that could have positive outcomes.

Foster, C. (2011). A picture is worth a thousand exercises. *Mathematics Teaching*, (224), 10-11.

Foster introduces a method of discovery in which students are given graphing software to make their own discoveries about transformations. He argues that students creating and changing graphs on their own is a more effective method than simply presenting the material. This idea is a great tool for teaching graphs in algebra. Students can discover the different effects of changing slope or y-intercept and make connections on their own.

Ketterlin-Geller, L. R., Jungjohann, K., Chard, D. J., & Baker, S. (2007). From arithmetic to algebra. *Educational Leadership*, *65*(3), 66-71.

This article focuses on the early introduction of algebraic concepts as well as tying the concepts of arithmetic to algebra. The authors give several specific strategies to implement this in an algebra classroom including (but not limited to) symbol manipulation and decomposing word

problems. This article is great for practical strategies that can be used to help students at all levels of learning.

Marzano, R. J., & Heflebower, T. (2011). Grades that show what students know. *Educational Leadership*, *69*(3), 34-39.

In this article, Marzano and Heflebower explain in depth the components of Standards Based Grading. From what is included in the actual grade to how to assign a grade on a new scale, this article is an in-depth look at the new system. Marzano is a trusted name in education and his article is very supportive of SBG. This is a great article for any teacher in the Omaha Public Schools because Marzano seems to be a name many people trust and this article describes almost exactly what we do.

Newton, K. J., Star, J. R., & Lynch, K. (2010). Understanding the development of flexibility in struggling algebra students. *Mathematical Thinking an Learning*, *12*, 282-305.

Newton, Star and Lynch study the effects of flexibility in an algebra setting. When students are given different strategies/methods to solve the same problem they are more likely to be successful. Also, choosing the most efficient strategy becomes a higher-order thinking skill that students can gain over time. As a teacher it is important to introduce different strategies to students so they do not get stuck with memorizing steps or trying to solve each problem the same.

Oishi, L. (2011, October). A new age for algebra. *District Administration*, 66-72.

This article first demonstrates the continued need for success in algebra in today's society. It goes onto identify several variables for success such as multiple solutions and innovative programs. Oishi also gives the reader several additional resources that can be accessed. This article is a great illustration for a math teacher about teaching for success.

Panasuk, R. M. (2010). Three phase ranking framework for assessing the conceptual understanding in algebra using multiple representations. *Education*, *131*(2), 235-257.

Panasuk explores teaching algebra with multiple representations as part of the lesson each day. She argues that students will relate those multiple representations and have a deeper understanding of the big ideas of algebra. Multiple representations also allow students more options when completing their work and appeal to different learning styles. Teachers who teach with these multiple representations are sure to hit the learning styles of all of their students. Teaching different approaches to a concept is a great way to ensure success.

Scriffiny, P. L. (2008). Seven reasons for standards-based grading. *Educational Leadership*, *66*(2), 70-74.

In this article, Scriffiny discusses the shift toward Standards Based Grading in education today. She lists and explains seven positive reasons to make the change. This article is a great resource for teachers considering and teachers already using SBG because it is very descriptive and uplifting.

Vogel, C. (2008, May). Algebra: Changing the equation. *District Administration*, 34-40.

This article points out the need for constantly improving algebra curriculum. It illustrates the need for algebra with statistics and reasoning and goes on to describe several practical ways to help students be successful. Additionally, the article lists several online resources that can be accessed by teachers. This article validates a teacher's importance in the teaching of algebra and can be accessed when alternative methods are needed.