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Eighth Grade Mathematics Curriculum Alignment for School District 27J

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Disclaimer

EIGHTH GRADE MATHEMATICS CURRICULUM ALIGNMENT FOR SCHOOL DISTRICT 27J

by

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ABSTRACT

This project aligns the curriculum taught in eighth grade mathematics courses in School District 27J to the Colorado Academic Standards (CDE, 2009b). This project includes a yearly planning matrix, for implementation in the 2010-2011 school year. The review of literature defined curriculum and the benefits of curriculum alignment. This information helped to create the yearly planning matrix that aligned the current eighth grade resources to the new standards. The main goal of this project is to ensure that all students in eighth grade receive consistent instruction in each standard, which leads to success on the state standardized tests.

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Chapter 1

INTRODUCTION

Stiff (2002), the President of the National Council of Teachers of Mathematics (NCTM) from 2000-2002, wrote, "It is time to expand the expectations of each grade band associated with each content standard into a scope and sequence that teachers can use to implement the *Standards* more effectively" (p. 2). National tests are in alignment to the national standards that the members of the NCTM developed. Therefore, what a teacher delivers in classrooms must be in alignment with national assessments that measure student achievement. Glatthorn, Boschee, and Whitehead (2006) stated, "curriculum alignment is a process of ensuring that the written, the taught, and the tested curricula are closely congruent'' (p. 278). Thus, there needs to be alignment between the national and state standards, the instruction in the classroom, and standardized assessments.

Statement of the Problem

In a small, but growing school district in Colorado, eighth grade students are required to take the Colorado Student Achievement Program (CSAP; CDE, 2009b) assessment in four subject areas: (a) reading, (b) writing, (c) mathematics, and (d) science each year in March. In the area of mathematics, there are gaps between what students learn in the algebra curriculum and what students see on assessments. Therefore, it is necessary to identify the areas where the curriculum is not in alignment to the state standards, and then develop a scope and sequence that aligns the current

curriculum to the state standards. Where the current curriculum is not in alignment to the eighth grade mathematics standards, additional material needs to be included to address those standards and/or evidence outcomes. With the inclusion of additional material for the current scope and sequence, students will be better prepared to demonstrate competency on the mathematics standards. Ultimately, the use of a scope and sequence aligned to the state standards will allow students to be more successful on the CSAP (2009b) assessment.

Purpose of the Project

The purpose of this project is to present the current eighth grade mathematics teachers in School District 27J with a scope and sequence that is in alignment to the eighth grade mathematics standards and includes material from the current resource, *Algebra Connections* (Dietiker et al., 2006). The scope and sequence includes supplemental materials to address the standards and evidence outcomes where the students are not currently able to demonstrate competency. In addition, target dates are included for the 2010-2011 school year, when this scope and sequence implementation should occur.

The presentation of the scope and sequence is in the form of a yearly instructional planning matrix that includes: (a) the chapters taught from *Algebra Connections* (Dietiker et al., 2006) with unit objectives, (b) the standards, (c) concepts and skills to master, (d) evidence outcomes addressed, (e) the skills developed, and (f) target dates. In areas where the current resources are not in alignment to the state standards, the scope and sequence will include additional materials and resources to address those standards.

The purpose for the inclusion of this information is to ensure that all students in this school district will have exposure to all grade level material; therefore, every student will be prepared for success on the state assessment.

Chapter Summary

In summary, the development and use of a scope and sequence aligned to the eighth grade mathematics standards should increase student success on the CSAP (CDE, 2009b). Presented in Chapter 2, the Review of Literature, is the purpose of curriculum alignment to the mathematic standards. Additionally, Chapter 2 provides analyses of several research studies where curriculum alignment and student achievement on standardized tests had a positive correlation. Together the purpose of a curriculum alignment and recent research studies present a case for the importance of curriculum alignment.

Chapter 2

REVIEW OF LITERATURE

The standards based movement, which began in the 1990s, has shaped public education (Osta, 2007; Parke & Lane, 2008). The requirement for national reform has increased the importance of teachers' instruction of the national and state standards in each subject area. In addition, this means that student scores on high stakes assessments are more important than previously. However, if the material presented to the students does not include skills and practice that will help the students master grade level standards, then the students may experience failure, through no fault of their own. The purpose of this project is to develop a scope and sequence that is aligned to the eighth grade mathematics standards, for a small but growing school district in Colorado.

Curricular Concepts

Curriculum is much more than the concepts included in a textbook. Glatthorn, Boschee, and Whitehead (2006) defined curriculum as:

> The plans made for guiding learning in the schools, usually represented in retrievable documents of several levels of generality, and the actualization of those plans in the classroom, as experienced by the learners and as recorded by an observer; those experienced take place in a learning environment that influences what is learned. (p. 5)

In this definition, the plans and the learning experiences are included. Inclusion of the learning experiences is important because, often, the designed plans are manipulated to

meet the needs of the learners in the classroom. In addition, the learning environment is included in this definition, because it influences how students interpret different material.

Types of Curricula

Goodlad and Associates (1979, as cited in Glatthorn et al., 2006) identified several different types of curricula: (a) ideological curriculum, (b) formal curriculum, (c) perceived curriculum, (d) operational curriculum, (e) experiential curriculum and (f) the closely related hidden curriculum. The more commonly used terms are: (a) recommended curriculum, (b) written curriculum, (c) supported curriculum, (d) taught curriculum, (e) tested curriculum, and (f) learned curriculum (Glatthorn et al.). The intentional curriculum includes the written, supported, taught, and tested curriculum. What is not intentionally planned is the hidden curriculum.

Glatthorn et al. (2007) stated that "Recommended curricula are typically formulated at a rather high level of generality; they are most often presented as policy recommendations, lists of goals, suggested graduation requirements, and general recommendations about the content and sequence of field of study" (p. 7). Cruickshank, Jenkins, and Metcalf (2003) have renamed the recommended curricula as the formal curricula. Members of national organizations, such as the National Council of Teachers of Mathematics (NCTM) and the National Association for Secondary School Principals (NASSP), influence what is included in the recommended curricula. In addition, societal trends influence how current policymakers think; ultimately, these trends influence what is included in the recommended curricula. One current trend that is included in the recommended curricula is the basic use and understanding of technology.

The written curriculum is what is included in state and school district curriculum guides (Glatthorn et al., 2006). When these documents are properly used by teachers, the information included in the documents will help teachers to make and plan lessons that support the learning goals for the given grade level. Usually, these documents reflect the ideas of the curriculum director, subject coordinator, principals, and subject teacher leaders. The purpose of the written curriculum is to suggest and control what teachers present to students. Additionally, the written curriculum communicates the expectations of what teachers present in the classroom.

The supported curriculum represents the resources allocated to support the written curriculum (Glatthorn et al., 2006). The time devoted to deliver the curriculum, personnel resources, textbooks, and other materials are all resources needed to support the written curriculum. Often, state guidelines, principals' beliefs, and community members have an unmistakable affect on the supported curriculum.

The taught curriculum is what the teacher actually instructs (Glatthorn et al., 2006); thus, it is the actions the teacher takes to deliver the curriculum to the students. Cruickshank et al. (2003) suggested that the society, students, and recommended curricula all have an impact on what teachers will ultimately teach; teachers are the final filter of the curriculum before students interact with the curriculum. The taught curriculum includes all of the differentiated instruction that a teacher uses to meet the learning needs of individual students.

The tested curriculum represents all avenues used to assess student knowledge, for example: (a) teacher made tests, (b) district assessments, and (c) standardized tests

(Glatthorn et al., 2006). Usually, teacher made test are multiple choice, which do not assess higher order thinking. Typically, district designed tests are curriculum-referenced and help to drive instruction. However, for these tests to be effective, teachers must believe the design of the assessments assess students' learning. In addition, teachers must comply by using district mandated tests to assess students' learning.

What students learn from the taught curriculum will vary from student to student (Glatthorn et al., 2006). The learned curriculum is what individual students experience in the classroom that changes the student's values, perceptions, and behaviors. The learned curriculum encompasses the intentional and planned curriculum as well as the hidden curriculum. The hidden curriculum includes the "aspects of the learned curriculum that lie outside the boundary of the school's intentional efforts" (p. 22). Sadker and Sadker (2000) defined the hidden curriculum as what "emerges incidentally from the interaction between the students and the physical, social, and interpersonal environments of the school" (p. 203). Thus, the learned curriculum is much more than just the written, due to the uniqueness of each individual's learning style and background knowledge brought into the classroom.

Components of Curriculum

There are two types of curricular policies: macropolicies and micropolicies (Glatthorn et al., 2006). Macropolicies are those that address what students are to know at the end of their education. One example of a macropolicy is the requirements for graduation, which members of the school board set. Micropolicies are recommendations for a curriculum in a particular subject area. Macropolicies and micropolicies together

make curricular policies, which are a set of rules and guidelines that direct the development and implementation of curriculum.

Curricular goals, also known as the long term educational goals, are the goals that students are expected to gain from the curriculum (Glatthorn et al., 2006). Sadker and Sadker (2000) stated that the "plan for learning, its content, and learning experiences need to be organized so that they serve the educational objectives" (p. 203). In one school district in Colorado, the curricular goals are the essential learning targets (School District 27J, 2007). The essential learning targets the 40 year curricular goals, while the success criteria is the 40 day goal or the unit objectives. Individual classroom teachers create daily learning objectives to move students toward the success criteria.

Other components of the curriculum include the: (a) fields of study, (b) programs of study, (c) courses of study, (d) unit of study, and (e) lessons (Glatthorn et al., 2006). In Grades K-12, the fields of study are: (a) language arts, (b) mathematics, (c) science, and (d) social studies. However, at the college level, the fields of study become more specific. The programs of study are the time allocated each week to a particular subject area. The course of study is the written curriculum, which is the units of study combined together over a period, in which a student may receive credit upon completion at the end of the course. Usually, units of study last 1-3 weeks and are part of the course of study. Within the units of study are the individual lessons that, when taught in a sequential order, represent the unit of study.

Standards Movement

In *A Nation at Risk*, published by the members of the National Commission on Excellence in Education (NCEE; U.S. Department of Education, 1983), it was suggested that there was a need for change in the process of education in the United States. After this description of the harsh facts of the education for adults and children in the early 1980s, the members of the NCEE felt that all children needed encouragement to develop to their fullest potential. Thus, high standards became the expectation in schools, and teacher encouragement would help students meet new challenges and stretch their talents and abilities. This was the beginning of the movement toward a standards based education system in the U.S.

According to the staff of the U.S. Department of Education (2003), "Academic standards refer to statements of expectations for student learning and achievement. Academic standards are composed of both academic content standards and student academic achievement standards" (p. 1). Listed in the content standards are what students should be able to demonstrate after completion of a unit. Listed in achievement standards lists are what students must demonstrate for proficiency. In achievement standards, it is clarified what students are expected to know within a particular content area. "Thus, it is essential that a State's Achievement standards be aligned with its content standards" (p. 1).

No Child Left Behind Act

The No Child Left Behind Act (NCLB) was signed into law on January 8, 2002 (U.S. 107th Congress, 2002). The sole purpose of the Act was "to close the achievement

gap with accountability, flexibility, and choice, so that no child is left behind" (p. 1). The purpose of the Act is to ensure that all children have an opportunity to meet minimum proficiency on state assessments. One thing this Act required was a strengthening in accountability for teaching and assessment of state academic achievement and content standards. This was another push for the movement to a standards based education system.

As a result, of this Act, state educators had to design both content and achievement standards and design a system for accountability for the teaching of the standards (Schoenfeldt & Salsbury, 2009). In many states, there is a state designed standardized assessment to compare students' growth and teacher quality.

National Mathematics Standards

The members of the NCTM (2006) first developed and published national standards in 1989. Since 1989, the standards changed due to many revisions over the years. Published in 2000 in *Principles and Standards for School Mathematics*, was the last revision of the national mathematics standards (as cited in NCTM). In the current standards, there is clarification and elaboration of the standards created in 1989. The purpose of the national standards is to ensure that mathematics presented in classrooms has meaning to the students. Thus, the written, taught, learned, and test curriculum should be in alignment.

However, for some teachers, it is difficult to understand the intent of the national standards. To define the important components within each standard at each grade level, the NCTM (2006) members created another document. Committee members expressed

their collective work in a published title called the *Curriculum Focal Points*. The purpose of the focal points is to provide teachers with opportunities to improve their mathematics teaching as they help students to make connections between the concepts and skills they have learned. Additionally, there is ongoing emphasis on the need for students to use problem solving, reasoning, and critical thinking skills to solve realistic problems when they learn mathematics.

Colorado State Mathematics Standards

The staffs of each state department of education have developed academic and achievement standards (Schoenfeldt & Salsbury, 2009). In the Colorado Academic Standards: Mathematics (CDE, 2009a), there are general expectation statements of what students should be able to demonstrate at each grade level. Then the standards are broken down into evidence outcomes for specific content, skills, and ideas students should be able to demonstrate after completion of the grade level.

Schoenfeldt and Salsbury (2009) suggested that teachers select a topic and then match it to the relevant state standards and focus on those skills, ideas, and concepts during instruction. However, Glatthorn et al. (2006) suggested that, first, standards should be identified and then the lesson be designed around the standard; thus, it is insured that the curriculum is standards based.

Curricular Alignment

In many schools, there is little correlation between the written curriculum, the taught curriculum, and the summative assessments (Glatthorn et al., 2006). One way to approach this problem is to align the curriculum with the standards. Curriculum

alignment ensures that the rudiments of effective instruction coincide with clear and concise learning goals. Therefore, ultimately, the curriculum alignment will lead to more students to have success on standardized assessments.

A Rationale for Curriculum Alignment

The written curriculum and the taught curriculum should be directly linked (Glatthorn et al., 2006). The written curriculum represents the learning objectives for a given group of students within a school district. Thus, a consensus within a school district on the content presented in individual classrooms is necessary. In one study conducted by Fisher et al. (1978, as cited in Glatthorn et al.), a teacher did not teach about fractions for a period of 90 days as mandated by the state assessment frameworks. The omission of this section was because of the teacher's dislike of fractions. As a result, it was difficult for these students to solve problems that incorporated fractions.

To avoid situations, like the one in the preceding paragraph, teachers must be accountable for the implementation of the curriculum guides designed by the school district personnel. The curriculum taught in the classroom should be limited to what students need to demonstrate on the state standards (Glatthorn et al., 2006). Beyond the state standards, any additional items incorporated into the curriculum need to happen with careful consideration of time and assessment possibilities.

Along with alignment of the curriculum to the state standards, there must be a close relationship between what teachers instruct in a classroom and what is tested (Glatthorn et al., 2006). The assessments that students are required to take should be

curriculum based. Standardized state assessments will not suffice in this case, because the relationship between these assessments and curriculum are not in alignment.

Curricular Design

In a standards based curriculum, which usually has high stakes testing, typically, the planning follows a top-down model (Glatthorn et al., 2006). In this model of curriculum, the clearly defined plan has strong links to the content standards. Usually, the district curriculum director, but may also include local university professors, supervises the alignment project within a school district.

Glatthorn et al. (2006) suggested that the process for curriculum design should include "goal development, defining courses, dividing courses in units, planning units, and formulating lessons" (p. 280). Another term that is used for this process is mapping (Ornstein, 1990). However, in the use curriculum mapping, teachers are required to identify the content, concepts, and skills developed within an entire course. Curriculum maps help curriculum developers and planners to understand the purpose of the course for an entire year. If the completion of the curriculum map occurs before individual units and lessons developed, then the content, concepts, and skills within the unit or lessons will be the goals and objectives of the course (Ornstein).

Well written curriculum will have clear and concise stated goals (Glatthorn et al., 2006). The more complex ideas and skills will follow the clear and concise goals. Teachers and other curriculum planners should consider the students' abilities in skills when planning a curriculum. In a spiraling curriculum, the more complex skills and ideas follow the simpler skills and ideas.

Concepts, skills, and ideas that are required as mandatory for students to learn are included in the curriculum design and required for all students (Glatthorn et al., 2006). Some concepts, skills, and ideas of curriculum design will be required only for some students, and those elements are elective. Once these concepts, skills, and ideas are defined, a curriculum based test needs to be designed. This leads to a close correlation between the taught, learned, and tested curriculum.

Research Studies

Several studies exist on curriculum alignment. Some research studies have been as simple as a comparison of student assessments to standards, such as the one completed by Parke and Lane (2008). Other research studies have been more complicated, such as a comparison of student achievement on standardized tests with differences in the type of curricula and instruction students experience in the classroom. Riordan and Noyce (2008) and McCaffrey et al. (2001) conducted research in this area. There exist national studies in countries where there is a national curriculum. Osta (2007) conducted an example of this type of research with the use of data collected for curriculum and student achievement in the country of Lebanon.

Maryland

Parke and Lane (2008) completed a study to test the hypotheses of: (a) a possible correlation between learning activities, (b) student assessment, and (c) the Maryland performance standards. The authors of this study studied the different levels of compliance of instructional activities in comparison to the Maryland performance

standards across grade levels and the alignment between instructional activities and assessments.

In Maryland, the state standardized test, Maryland School Performance Assessment Program (MSPAP), measured the progress the students make toward mastery of the Maryland Learning Outcomes (MLO; MSDE, 1995, as cited in Parke & Lane, 2008). The Parke and Lane study was unique, in that, it was a large scale study of instructional activities and practices across the state of Maryland. The participants in the study were mathematics teachers who taught Grades 3, 5, and 8, since these students took the MSPAP. The researchers then used a random sample of 250 teachers to collect the data.

Classroom activities were analyzed on the following criterion: (a) process; (b) content; (c) response type; (d) analysis of charts, tables, and graphs; (e) use of manipulatives; (f) interdisciplinary; and (g) relatedness to MSPAP (Parke & Lane, 2008). This study was part of a larger study that evaluated the effectiveness of the MSPAP. The researchers used a coding of system of 1 through 5 to rate the instructional activities. A rating of 1 meant that the activity was not like MSPAP, a rating 2 meant that the activity included only graphs, tables, and patterns, a rating of a 3-5 represented a low to high correlation to MSPAP. With use of this scale, the researchers found that about one-third of the instructional activities had a low correlation to the MSPAP. Additionally, almost one-half of the instructional activities were irrelevant to MSPAP. In contrast, two-thirds of the assessments were not in alignment to MSPAP.

Based on the results presented by Parke and Lane (2008), there was little correlation between the taught curriculum and tested curriculum. However, Parke and Lane concluded, "that no single source of data provides all the information necessary to determine the extent to which classroom practice reflect the goals and vision of the reform-oriented standards and accountability systems" (p. 144).

Massachusetts

Riordan and Noyce (2001) studied the effects of the adoption of certain curricula on student achievement over a certain time period. This study measured student achievement by the Massachusetts Comprehensive Assessment System (MCAS), which was in alignment to the Massachusetts Mathematics Curriculum Framework, *Achieving Mathematical Power*. The two curricula, which were in comparison to the control group, were *Everyday Mathematics* (Bell, 1988-1996) and *Connected Mathematics* (Lappan, Fey, Fitzgerald, Friel, & Phillips, 1991-1997; both cited in Riordan & Noyce). Both of these curricula, by design, encourage students to work in cooperative groups and use manipulatives. In addition, students are encouraged to solve the problems in multiple ways; therefore, students are encouraged to develop their own way of thinking.

According to Riordan and Noyce (2001), the collected data were from the Massachusetts Educational Assessment Program (MEAP) test results from 1992-1996 and Massachusetts Comprehensive Assessment System (MCAS) test results from 1999. Also included were data from schools, where either *Everyday Mathematics* (Bell, 1988-1996) or *Connected Mathematics* (Lappan et al., 1991-1997; both cited in Riordan & Noyce) were fully implemented the program. However, the level of implementation

ranged from 1 year to more than 4 years. Not taken into consideration was the level of compliance for these two programs, because previous researchers (Boaler, 1998; Stein, Lane, & Silver, 1996; both cited in Riordan & Noyce) found that programs not optimally implemented, still had an impact on student achievement.

Students, exposed to *Everyday Mathematics* (Bell, 1988-1996) or *Connected Mathematics* (Lappan et al., 1991-1997; both cited in Riordan & Noyce, 2001) outscored students not exposed to either one of these standards based curriculums. On the comparison between the control group and *Everyday Mathematics* group, the differences in the scores on the test were highly significant ($p < .001$). Also, the results for students who were exposed to *Connected Mathematics* were highly significant ($p < .001$) When the results of the test scores were compared for students who had *Everyday Mathematics* for 3 or less years to 4 or more years, the differences in test scores were highly significant ($p < .001$). On the other hand, in a comparison between students who had *Connected Mathematics* for 3 or fewer years to 4 or more years, the differences in the test scores were only statistically significant ($p < .05$).

The results from the Riordan and Noyce (2001) study supported the idea that the use of a standards based curriculum that integrates cooperative learning and higher level mathematical reasoning will increase student achievement, as measured by MCAS. Furthermore, over time, the impact of these curriculums was positive.

Georgia

The purpose of the study conducted by Mitchell (1999) was to study the effectiveness of curriculum alignment in the Dekalb County School System after 1 year

of implementation. This study included all of the third grade students in the school district who took the Iowa Test of Basic Skills, which Riverside Publishing Company (as cited in Mitchell) produces, in 1996. Excluded from the data were retained students with limited English proficiency. In addition, there were 12 elementary schools excluded from the data because of the school reform effort in which the teachers and students participated in at the time.

Mitchell (1999) tested several hypotheses surrounded by curriculum alignment. One hypothesis was that curriculum alignment would affect student achievement on the ITBS both significantly and positively. Other hypotheses included no impact on scores on the ITBS among gender, race, school size, and socioeconomic groups of low, moderate, and high poverty levels.

This was a quantitative descriptive study, which used the pre and post assessment format (Mitchell, 1999). The pretest was the 1996 ITBS third grade mathematics results. These results were compared to the 1997 ITBS third grade mathematics results. All third grade mathematics scores were included, unless the student was retained for the 1996-1997 school year, had limited English proficiency, or attended 1 of the 12 schools that were under restructure.

Analyses of the ITBS test scores were completed by using a *t* test and analysis of variance (ANOVA; Mitchell, 1999). "A t-test was used to test Ho 1, and an ANOVA was used to test Ho 2-4" (p. 9). The *t*-test was used to analyze the overall score of all third grade students, and ANOVAs were used to compare the factors of: (a) socioeconomic status, (b) race, (c) gender, and (d) school size.

According to Mitchell (1999), curriculum alignment took place in 1996 after Administration of the ITBS. Therefore, the 1996 test scores were the pretest, and the 1997 scores were the posttest. There were no statistically significance differences between the 1996 and 1997 ITBS scores for third grade students after curriculum alignment; therefore, Hypothesis 1 was invalid.

Furthermore, there were no statistically significant differences for student achievement (Mitchell, 1999). However, all subgroups had some gains in their performance on the 1997 ITBS assessment. The subgroups that showed the most gains were the moderately low socioeconomic group and the African American group.

Based on the results from the (Mitchell, 1999) study, the gains the students made were not statistically significant. However, subgroups had made some gains. After 1 year of implementation, the effect on student achievement may not be the direct result of curriculum alignment. In comparison, there were gains made by the students in this "suburban-emerging-urban school district" (p. 1) in Georgia. "Curriculum Alignment when used in a large metropolitan school system appears to have a significant positive effect on the student achievement of all third graders in mathematics" (p. 20).

Lebanon

In Lebanon, there is a focus on national examinations (i.e., official exams), that are used for students' promotions and graduation from school (Osta, 2007). Osta focused the study on the effects of assessment driven instruction. Lebanon has a national curriculum that is in effect for both public and private schools. In the public school setting, teachers can only present the national curriculum. Official exams measure

student achievement and the quality of instruction. Thus, these exams are high stakes for both the students and teachers.

Curriculum reform began in 1997 in Lebanon with full implementation in 2000, after 30 years of the old curriculum (Osta, 2007). The new curriculum includes goals and learning objectives, which target higher level thinking skills. However, changes to the official exams do not reflect the major shift in the written and taught curriculum.

When the *Trends in International Mathematics and Science Study* (TIMMS; 2003) and *Program for International Student Assessment* (PISA; 2003, both cited in Osta, 2007) was administered in Lebanon, the results were drastically different from what was expected. The eighth grade students scored 433, which was 33 points lower than the international average. The results suggested that the written curriculum and the classroom instruction were not in alignment. Osta suggested the instructional shift has not occurred because the official exams focus on memorization of facts and procedures.

The study that Osta (2007) conducted was part of a larger study in Lebanon that investigated "the mathematical abilities tested by the official mathematics exams in Lebanon and the alignment between the official examination tests and the math curriculum" (p. 177). The results of the study will guide further investigation of the problems that prevent the alignment between the reform curriculum and the official exams.

To complete the study, both qualitative and quantitative data were collected (Osta, 2007). Qualitative analysis was used to analyze the prereform official exam test and

structure. Quantitative analysis was used to analyze the alignment of the official exam to the national content standards and process skills.

After analyses of the official exam, Osta (2007) recognized an imbalance of what was on the exam and what was included in the mandated curriculum. On the official exams, the most attention was on plane geometry, followed by analytical geometry, then algebra. However, on the model test, which is in alignment to the curriculum, plane geometry, sets, and algebra receive the most attention. In regards to the assessed problem solving skills, the official exams contain 60.86% procedural knowledge questions. However, on the model test 39.12% are procedural knowledge questions, 42.72% are conceptual understanding questions, and 18.14% are problem solving questions. These imbalances between the official exam, model test, and national curriculum show there is an imbalance between the written and tested curriculum.

After 7 years of implementation, there is need for further reform on mathematics education in Lebanon (Osta, 2007). Osta stated that, "the educational community senses a set-back to the old curriculum practice" (p. 197), because of the inconsistency between the written, taught, and tested curriculum. Osta suggested that curriculum reform continue by "reconsidering the testing policies, contents, and formats" (p. 197).

Chapter Summary

The concept that standards based curricula can increase student achievement is supported by many researchers, such as (a) Parke and Lane (2008), (b) Osta (2007), (c) Glatthorn et al. (2006), (d) Riordan and Noyce (2001), (e) McCaffrey et al. (2001), and (f) Mitchell (1999). It is not only important for the written curriculum to be in alignment

to the state standards, but also the taught, learned, and tested curriculum should be in alignment to the state standards. When curricula are not in alignment to state standards, the impact on student achievement is not nearly as much as curricula that are in alignment. Therefore, it is important to make sure the written, taught, learned, and tested curriculum is in alignment to state standards. Chapter 3 outlines the method, target audience, organization of the project, and peer assessment.

Chapter 3

METHOD

The members of the National Council of Teachers of Mathematics (NCTM; 2006) encourage the teaching of different mathematical content throughout K-12 education. They recommend that teachers: (a) emphasize problem solving skills, (b) make connections between different mathematical ideas, and (c) utilize written communication skills throughout mathematics instruction. Assessed are both content and problem solving on state standardized test (Schoenfeldt & Salsbury, 2009). Data are collected from the standardized test to evaluate student learning, teacher performance, and curricula. Therefore, it is important to make sure that the written, taught, learned, and tested curricula is congruent. Thus, student scores on high stakes assessments are more important than before (Schoenfeldt & Salsbury). However, if the current resources within a classroom do not cover all of the standards, then the students will not do well. The purpose of this project is to develop a scope and sequence that is in alignment to the Colorado Academic Standards: Mathematics (CDE, 2009a) for students exposed to *Algebra Connections* (Dietiker et al., 2006) during their eighth grade year. The ultimate result is to have student prepared for success on the Colorado Student Assessment Program (CSAP; CDE, 2009b).

Target Audience

As a teacher plans units and individual lessons, it is crucial that the learning objectives are in alignment with the state standards. The development of this project is for eighth grade teachers in School District 27J, who teach mathematics. The ideas included in the project could expand to other teachers who teach an algebra course to eighth grade students in the state of Colorado.

Organization of the Project

The presentation of the scope and sequence is in the form of a yearly instructional planning matrix. The design of the yearly instructional planning matrix is so that implementation can begin at the start of the 2010-2011 school year. The planning matrix includes the following information: (a) the chapters taught from *Algebra Connections* (Dietiker et al., 2006) with unit objectives, (b) the standards, (c) concepts and skills to master, (d) evidence outcomes addressed, (e) the skills developed, and (f) target dates. In areas where the current resources are not in alignment to the Colorado Academic Standards: Mathematics (CDE, 2009a) the yearly planning matrix includes additional material to address those needs. The purpose for the inclusion of this information is to ensure that all students in School District 27J will have exposure to this material; therefore, every student who completes the eighth grade mathematics course will have exposure to the content assessed on the CSAP (CDE, 2009b).

Peer Assessment Plan

Four colleagues received a hard copy of the yearly instructional planning matrix and an evaluation protocol (Appendix A). The colleagues who reviewed the project

were: (a) the district mathematics coordinator, (b) a middle school principal, (c) a current eighth grade mathematics teacher, and (d) a former eighth grade mathematics teacher. They completed the evaluation protocol, which provided feedback and suggestions how to improve the project. In addition, each colleague provided information on success criteria, skills developed, and pacing. Discussed in Chapter 5 is the feedback that these four colleagues provided.

Chapter Summary

With all the knowledge students are required to have in order to be successful on CSAP (CDE, 2009b), it is important that teachers in Colorado thoroughly plan instruction that is aligned to state standards at each grade level. Throughout the project, the author used awareness of the effects of curriculum alignment to create a yearly instructional planning matrix for eighth grade mathematics in School District 27J. Presented in Chapter 4 is the yearly instructional planning matrix for the 2010-2011 school year.

Chapter 4

RESULTS

The Colorado Department of Education adopted the Colorado Academic Standards on December 10, 2009 (CDE, 2009a). Originally, number sense and computation were independent standards, but now comprise of only one standard in the Colorado Academic Standards (2009a). The other two standards that have merged are geometry and measurement. The algebra standard now contains patterns and functions. The inclusion of statistics is also of part the data analysis and probability standard. A table with a side by side comparison of the old standards and the new standards for K-12 students in Colorado is in Appendix B.

With the adoption of the new standards, it is critical that all school districts align their selected curriculum to the Colorado Academic Standards (CDE, 2009a). The following project aligns the current eighth grade math curriculum resource, *Algebra Connections* (Dietiker et al., 2006) with the recently adopted Colorado Academic Standards (CDE, 2009a). Resources and materials are included in the matrix to address the standards, which are missing in the current math resource *Algebra Connections* (Dietiker et al., 2006). The purpose for the inclusion of this information is to ensure that all students in this school district will have exposure to all grade level material; therefore, should ensure every student will be prepared for success on the state assessment.

The planning matrix includes the following information: (a) the chapters taught from *Algebra Connections* (Dietiker et al., 2006) with unit objectives, (b) the standards, (c) concepts and skills to master, (d) evidence outcomes addressed, (e) the skills developed, and (f) target dates. The unit objectives, listed in the yearly planning matrix are the success criteria for algebra. School District 27J developed the success criteria to insure that all teachers teaching the *Algebra Connections* (Dietiker et al., 2006) focus on the same concepts and skills when teaching algebra. The design of the chapter assessments are based on the success criteria taught during the duration of the chapter/unit. Having all this information located in one central document, teachers of eighth grade students are better equipped to help students be successful on the content assessed on CSAP (CDE, 2009b).

Algebra Connections
Yearly Planning Matrix
for the
2010- 2011 School Year

Target Dates: August 16-20 (5 Days)	
Content: Fraction Review	
Resource	Unit Objectives*
Fraction Review Appendix C	1. Evaluate fractions using addition, subtraction, multiplication, and division through various rules and models (SD27J, 2007, p. 1). 2. Choose and apply algorithms and appropriate methods in problem solving situations including mental math, sub-problems, models, x and y tables, estimation and reasonableness, [and] guess and check tables (p. 6).
Skills Developed	Comparing fractions Finding equivalent fractions Adding, subtracting, multiplying, and dividing fractions
Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Number Sense, Properties, and Operations** "In the real number system, rational and irrational numbers are in one to one correspondence to points on the number line" (CDE, 2009a, p. 27). 1. "Compare and order sets of integers and rational numbers that are expressed as fractions, decimals, or percents" (p. 27).

* The Unit Objectives are a direct replication of the Success Criteria listed in the *Math Learning Map* for School District 27J and are on the page numbers listed.

Target Dates: August 23-September 10 (13 Days)	
Chapter 1: *Problem Solving*	
Section	Unit Objectives*
1.1.1	1. Graph data on a coordinate system and be able to interpret and use the graph to extract more information (SD27J, 2007, p. 3). 2. Describe, predict, interpret, and draw conclusions using information that is shown in a graph (p. 3).
1.1.2	Graph data on a coordinate system and be able to interpret and use the graph to extract more information (p. 3).
1.1.3	1. Use various forms of data collection (p. 4). 2. Organize and construct data into tables, charts, graph, lists and diagrams (p. 4). 3. Select the appropriate scale for a given problem… (p. 6). 4. Determine the graph (line or curve) of best fit for a [scatter plot] to make predictions (p. 4).
1.1.4	1. Solve problems by represent and analyzing patterns using variables, tables, words, concrete objects, or pictures (p. 2). 2. Organize and construct data into tables, charts, graphs, lists and diagrams (p. 4).
1.2.1-1.2.3	1. Perform basic operations in mathematics following the order of operations and evaluate expressions containing grouping symbols (p. 1). 2. Solve problems by representing and analyzing patterns using variables, tables, words, concrete objects, or pictures (p. 2). 3. Translate written words to algebraic expressions/equations... (p. 2). 4. Solve multi-step equations and inequalities and use them to solve problems (p. 2). 5. Develop and use formulas to compare, justify, and solve problems involving perimeter, area, and volume of regular and irregular figures (p. 5). 6. Calculate the area, surface area, perimeter, volume, and circumference of various shapes using formulas and sub problems and understand the implications of the solution (p. 6). 7. Determine the reasonableness of a solution (p. 6). 8. Choose and apply algorithms and appropriate methods in problem solving situations including mental math, sub-problems, models, x and y tables, estimation and reasonableness, [and] guess and check tables (p. 6).

Skills Developed	Reading data on a graph Reading coordinate points Plotting coordinate points Collecting, organizing, and analyzing data Describe patterns in words and mathematical expressions Problem solving with two or more variables Changing dimensions of a geometric shape Calculating area and perimeter in a problem solving situation
Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Number Sense, Properties, and Operations** *"Formulate, represent, and use algorithms with rational numbers flexibly, accurately, and efficiently"* (CDE, 2009a, p. 28). 1. "Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals" (p. 28). 2. "Apply computational methods to solve multi-step application problems involving percents and rational numbers" (p. 28). **Patterns, Functions, and Algebraic Structures** *"Linear functions model situation with a constant rate of change and can be represented algebraically, graphically, and using tables"* (p. 62). 1. "Identify the dependent and independent variable in real-world situations" (p. 62). *"Properties of algebra, equality, and inequality are used to solve linear equations and inequalities"* (p. 63). 1. "Solve inequalities in one variable equations including those involving multiple steps rational numbers, variables on both sides, and the distributive property" (p. 63). **Data Analysis, Statistics, and Probability** *"Visual displays and summary statistics of two-variable data condense the information data sets into usable knowledge"* (p. 87). 1. "Given a scatter plot suggesting a linear relationship, draw a line of fit to make predictions" (p. 87).

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Target Dates: September 13-October 6 (16 Days)	
Chapter 2: *Variables and Proportions*	
Section	Unit Objectives*
2.1.1-2.1.6	Simplify and solve linear expressions, equations and inequalities using physical materials, calculators and computers (SD27J, 2007, p. 2).
2.1.7	1. Simplify and solve linear expressions, equations and inequalities using physical materials, calculators and computers (p. 2). 2. Solve multi-step equations and inequalities and use them to solve problems (p. 2).
2.2.1-2.2.3	1. Solving problems and estimating with numbers using proportional thinking (p. 2). 2. Compare, create and solve ratios and proportions using models and numbers in problem solving situations (p. 5).
Skills Developed	Identifying variables Writing algebraic expressions Simplifying expressions Comparing inequalities with variables Writing and solving algebraic equations with one variable Writing and solving proportions
Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Patterns, Functions, and Algebraic Structures** *"Properties of algebra, equality and inequality are used to solve linear equations and inequalities"* (CDE, 2009a, p. 63). 1. "Use the distributive, associative, and commutative properties to simplify algebraic expressions" (p. 63). 2. "Solve one-variable equations including those involving multiple steps, rational numbers, variables on both sides and the distributive property" (p. 63). 3. "Solve inequalities in one variable including negative coefficients and graph the solution on a number line" (p. 63). 4. "Represent the distributive property in a variety of ways including numerically, geometrically and algebraically" (p. 63).

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Target Dates: October 7-October 29 (16 Days)	
Chapter 3: *Graphs and Equations*	
Section	Unit Objectives*
3.1.1	1. Solve problems by representing and analyzing patterns using variables tables words concrete objects, or pictures (SD27J, 2007, p. 2). 2. Translate written words to algebraic expressions/equations and conversely, algebraic expressions/equations to word (p. 2).
3.1.2-5	1. Solve multi-step equations and inequalities and use them to solve problems (p. 2). 2. Graph data on a coordinate system and be able to interpret and e the graph to extract more information (p. 3). 3. Graph linear equation using patterns, slope-intercepts, point-slope, tables, ect. (p. 3). 4. Understand the relationship between graphs and equation with a focus on linear and quadratic equations (p. 3). 5. Describe, predict, interpret and draw conclusions using information that is shown in a graph (p. 3). 6. Apply the knowledge of graphs and their equations to solve real world problems (p. 3). 7. Organize and construct data into tables, charts, graphs, lists and diagrams (p. 4). 8. Select the appropriate scale for a given problem (for example, using the appropriate scale when setting up a graph or determining the order of numbers on a number line (p. 5). 9. Use graphing calculators to investigate both linear and non-linear functions (p. 6). 10. Use technology such as a calculator or computer software, to enhance understanding of mathematic relationships (p. 6).
3.1.6	1. Determine the most effective representation of data for a given situation, recognize inconsistencies and evaluate arguments that are based on these statistical claims (p. 4). 2. Graph data on a coordinate system and be able to interpret and e the graph to extract more information (p. 3). 3. Graph linear equation using patterns, slope-intercepts, point-slope, tables, ect. (p. 3). 4. Distinguish between linear and nonlinear functions through informal methods (p. 3).

3.1.7	1. Graph data on a coordinate system and be able to interpret and e the graph to extract more information (p. 3). 2. Graph linear equation using patterns, slope-intercepts, point-slope, tables, ect. (p. 3).
3.2.1	1. Solve multi-step equations and inequalities and use them to solve problems (p. 2). 2. Determine the reasonableness of a solution (p. 6).
3.2.2	Solve multi-step equations and inequalities and use them to solve problems (p. 2).
3.2.3	Simplify and solve rational expressions and equations and use techniques to solve real world problems (p. 2).
3.2.4	1. Solve multi-step equations and inequalities and use them to solve problems (p. 2). 2. Simplify and solve rational expressions and equations and use techniques to solve real world problems (p. 2). 3. Determine the reasonableness of a solution (p. 6).
Skills Developed	Graphing Techniques 1. Identifying the independent and dependent variable 2. Selecting an appropriate scale 3. Plotting data on a coordinate system 4. Using the graph to make predictions Translating words into algebraic expressions and equations Using a graphing calculator to make graphs from lists, tables, and equations Recognizing linear and non-linear patterns Solving equations with one variable both physically, graphically, and algebraically
Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Number Sense, Properties, and Operations** *"Formulate represent and use algorithms with rational numbers flexibly, accurately, and efficiently"* CDE, 2009a, p. 28). 1. "Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals" (p. 28). 2. "Apply computational methods to solve multi-step application problems involving percents and rational numbers" (p. 28). **Patterns, Functions, and Algebraic Structures** *"Line functions model situations with a constant rate of change and can be represented algebraically, graphically, and using tables"* (p. 62). 1. "Convert from one representation of linear function to another including situations, tables equations (slope-intercept form), and graphs" (p. 62).

	2. "Use representations of linear functions to analyze situations and solve problems" (p. 62). 3. "Identify the dependent and independent variable in real-world situations" (p. 62). *"Properties of algebra, equality, and inequality are used to solve linear equations and inequalities"* (p. 63). 1. "Use the distributive, associative, and commutative properties to simplify algebraic expressions" (p. 63). 2. "Solve one-variable equations including those involving multiple steps rational numbers, variables on both sides, and the distributive property" (p. 63). *"Graphs and tables can be used to distinguish between linear and nonlinear functions"* (p. 64). 1. "Given a table or graph determine if the function is linear" (p. 64). **Data Analysis, Statistics, and Probability** *"Visual displays and summary statistics of two-variable data condense the information in data sets into usable knowledge"* (p. 87). 1. "Make time plots (line graphs) to analyze the trend of a set data over time" (p. 87).

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Target Dates: November 1-November 23 (17 Days)	
Chapter 4: *Multiple Representations*	
Section	Unit Objectives*
4.1.1	1. Solve problems by representing and analyzing patterns using variables tables, words, concrete objects, or pictures (SD27J, 2007, p. 2).
4.1.2	1. Explain the concept of slope (rate of change) in a variety of given situations (p. 2). 2. Write linear equation in slope-intercept or point-slope form and understand the patterns that create the linear relationship (p. 2). 3. Simplify and solve linear expressions, equations and inequalities using physical material calculators and computer (p. 2).
4.1.3	1. Explain the concept of slope (rate of change) in a variety of given situations (p. 2). 2. Write linear equation in slope-intercept or point-slope form and understand the patterns that create the linear relationship (p. 2). 3. Graph data on a coordinate system and be able to interpret and use the graph to extract more information (p. 3). 4. Graph linear equations using patterns slope-intercept, point-slope tables, ect. (p. 3). 5. Use a graph to interpret rates of change (p. 3). 6. Describe, predict, interpret, and draw conclusions using information that is shown in a graph (p. 3). 7. Solve systems of linear equations and inequalities and interpret their solutions and their graphs (p. 3).
4.1.4-5	1. Graph data on a coordinate system and be able to interpret and use the graph to extract more information (p. 3). 2. Use a graph to interpret rates of change (p. 3). 3. Understand the relationship between graphs and equations with a strong focus on linear and quadratic equations (p. 3). 4. Translate written words to algebraic expressions/equations and conversely algebraic expression/equations to words (p. 2).
4.1.6	1. Understand the relationship between graphs and equations with a strong focus on linear and quadratic equations (p. 3). 2. Apply the knowledge of graphs and their equations to solve real world problems (p. 3).

4.1.7	Graph [linear] equations using patterns, tables, and various forms of the equations (p. 3).
4.2.1	1. Apply the knowledge of graphs and their equation to solve real world problems (p. 3). 2. Solve systems of linear equations and inequalities and interpret their solutions (p. 2). 3. Distinguish between linear and nonlinear functions through informal methods (p. 3).
4.2.2-4.2.3	1. Translate written words to algebraic expressions/equations and conversely algebraic expression/equations to words (p. 2). 2. Solve systems of linear equations and inequalities and interpret their solutions (p. 2).
4.2.4	Solve systems of equations with two or more variables and apply to real world problems (p. 2).
Skills Developed	Pattern recognition in geometric figures and tables Writing rules and algebraic expressions and equations Interpreting graphs 1. *y*-intercept (starting point) 2. slope (rate of change) 3. point of intersection 4. Independent and dependent variables Describing graphs by writing a story to match the graph Solving Systems of Equations 1. Equal Value Method
Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Patterns, Functions, and Algebraic Structures** *"Linear functions model situations with a constant rate of change and can be represented algebraically, graphically and using tables"* (CDE, 2009a, p. 62). 1. "Convert from one representation of a linear function to another including situations, tables, equations (slope-intercept form), and graphs (p. 62). 2. "Use representations of linear functions to analyze situations and solve problems" (p. 62). 3. "Indentify the dependent and independent variable in real-world situations" (p. 62). 4. "Identify and interpret the slop (rate of change) and y-intercept in graphs, in tables, and from equations in slope-intercepts form" (p. 62). 5. "Model and graph two linear equation in slope-intercept form on the same coordinate plane and interpret the point of intersection as the solution to the system of equations" (p. 62).

	"Properties of algebra equality, and inequality are used to solve linear equations and inequalities" (p. 63). "Solve one-variable equations including those involving multiple steps, rational numbers, variables on both sides, and the distributive property" (p. 63). "*Graphs and tables can be used to distinguish between linear and nonlinear functions"* (p. 64). 1. "Given a table or graph determine if the function is linear" (p. 64). 2. "Explain the properties of linear functions in tables and graphs" (p. 64).

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Target Dates: November 29-December 16 (14 Days: Includes 2 days for Semester Final)	
Chapter 5: *Multiplication and Proportions*	
Section	Unit Objectives*
5.1.1-5.1.3	1. Evaluate expressions using the various forms of the distributive property (p. 1). 2. Simplify and solve linear expressions, equations and inequalities using physical materials, calculators and computers (p. 2). 3. Multiply and factor polynomials (p. 2).
5.1.4	1. Evaluate expressions using the various forms of the distributive property (p. 1). 2. Solve multi-step equations and inequalities and use them to solve problems (p. 2). 3. Simplify and solve linear expressions, equations and inequalities using physical materials, calculators and computers (p. 2). 4. Multiply and factor polynomials (p. 2).
5.1.5	Write linear equations in slope-intercept or point slope form and understand the patterns that create the linear relationship" (p. 2).
5.1.6	1. Evaluate expressions using the various forms of the distributive property (p. 1). 2. Simplify and solve linear expressions, equations and inequalities using physical materials, calculators and computers (p. 2). 3. Multiply and factor polynomials (p. 2).
5.2.1-5.2.3	1. Solving problems and estimating with numbers using proportional thinking (p. 2). 2. Compare create and solve ratios and proportions using models and numbers in problems solving situations (p. 5).
Skills Developed	Area model for products Distributive property Order of operations Solving for a variable other than *x* Working with multiple variables in one equation Solving Systems of Equations 2. Equal Value Method 3. Substitution

Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Number Sense, Properties and Operations** *"Formulate represent, and use algorithms with rational numbers flexibly accurately and efficiently"* (p. 28). 1. "Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals" (p. 28). 2. "Apply computational methods to solve multi-step application problems involving percents and rational numbers" (p. 28). **Patterns, Functions and Algebraic Structures** *"Linear functions model situations with a constant rate of change and can be represent algebraically, graphically, and using tables"* (p. 62). 1. "Convert from one representation of a linear function to another including situations, tables equations (slope-intercept form, and graphs" (p. 62). 2. "Model and graph two linear equations in slope-intercept form on the some coordinate plane and interpret the point of interaction as a solution to the system of equations" (p. 62). *"Properties of algebra, equality, and inequality are used to solve linear equations and inequalities"* (p. 63). 1. "Use the distributive, associative, and commutative properties to simplify algebraic expressions" (p. 63). 2. "Solve one-variable equations including those involving multiple steps, rational numbers, variables on both sides, and the distributive property" (p. 62). 3. "Represent the distributive property in a variety of ways including numerically, geometrically, and algebraically" (p. 62).

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<table>
<tr><td colspan="2">Target Dates: January 3-January 14</td></tr>
<tr><td colspan="2">Content: Indentifying Shapes and Angles</td></tr>
<tr><td>Resources</td><td>Unit Objectives*</td></tr>
<tr><td>Classifying Quadrilaterals

Can a rectangle be a square? Can a square be rectangle? (Appendix D)

http://math.kennesaw.edu/~mdevilli/quadclassify.html

Students work with a given square and rectangle to investigate the properties of rectangles and squares. This website will assist in creating lessons on classifying shapes.</td><td>Make and test conjectures about geometric shapes and their properties (SD27J, 2007, p. 5).</td></tr>
<tr><td>Math Interactives

http://www.learnalberta.ca/content/mejhm/index.html?l=0

Within the Shape and Space link several lessons exists. These lessons include interactive activities, worksheets, and videos to demonstrate how math is used in everyday life.

Interactive
http://www.shodor.org/interactivate/activities/PythagoreanExplorer/

This site allows student to get immediate feedback on how they are using the Pythagorean Theorem.</td><td>1. Investigate angle relationships created by parallel lines cut by a transversal (p. 5).
2. Construct, analyze, and classify attributes and properties of two and three dimensional figures (for example, acute, obtuse, right angle, parallel lines, perpendicular lines, intersecting lines and line segments (p. 5).
3. Apply the properties of congruent and similar triangles and use the ratios of similarity, perimeter, and area (p. 5).
4. Use and apply the Pythagorean Theorem and trigonometric ratios to find missing sides and angles (p. 5).
5. Use the relationships of angles created by parallel lines cut by a transversal to solve real world situations (p. 5).
6. Apply the properties of interior and exterior angles of polygons in order to find missing angle measures (p. 5).</td></tr>
<tr><td>Skills Developed</td><td>Shape classifications
Angle identification
Angle measurement relationships
Pythagorean Theorem
Area and perimeter of regular shapes</td></tr>
</table>

Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Shape, Dimension and Geometric Relationships** "Objects in the plane and their parts and attributes can be analyzed" (CDE, 2009a p. 107). 1. "Classify quadrilaterals and apply angle and side properties, including the sum of the interior angles" (p. 107). 2. "Apply properties of complementary, supplementary, and vertical angle relationships" (p. 107). 3. "Apply properties of parallel lines including corresponding angles and alternate interior angles" (p. 107). "Direct and indirect measurements can be used to describe and make comparisons" (p. 108). 1. "Use the Pythagorean Theorem to find unknown lengths in right triangles" (p. 108).

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Target Dates: January 18-January 28 (9 Days)	
Content: Applications for Geometry	
Resources	Unit Objectives*
Applying Angle Theory http://www.onlinemathlearning.com/geometry-help.html *This is a list of resource to help teacher and students with the basic terminology of geometry. This resource includes information on parallel lines perpendicular lines, angles, triangles, polygons, circles, and solids.* http://www.onlinemathlearning.com/pairs-of-angles.html *This is a direct link to the angle page. This suits as an introduction to complementary and supplementary angles.* http://www.onlinemathlearning.com/find-the-angle.html *This is a direct link to the corresponding angle and interior angle page. After discussion, students should try to complete the Angle Game at the bottom of the page.*	Construct, analyze, and classify attributes and properties of two and three dimensional figures (for example, acute, obtuse, right angle, parallel lines, perpendicular lines, intersecting lines and line segments (SD27J, 2007, p. 5).
Perimeter, Area, and Volume http://www.aaaknow.com/geo.htm *This is a direct link for students to use to practice using their formulas. There are lessons, practice, and timed practice for the students. This site focuses on area, perimeter, circumference, surface area, and volume.*	Develop and use formulas to compare, justify, and solve problems involving perimeter, area, and volume of regular and irregular figures (p. 5).

Proportionality http://www.phschool.com/webcodes10/index.cfm?fuseaction=home.gotoWebCode&wcprefix=ase&wcsuffix=0775 *This link leads to video tutors. Within Chapter 7 there are eight geometry lessons. One of the lessons focuses on identifying triangles. In Chapter 4 there are videos on applying proportional reasoning.*	1. Explore properties of congruent and similar triangles and use the ratios of similarity, perimeter, and area (p. 5). 2. Compare, create and solve ratios and proportions using models and numbers in problem solving situations (p. 5).
Skills Developed	Angle identification Using and reading a protractor Using formulas to solve find perimeter, area, and volume Using substitution Setting-up and solving proportions Converting measurements from one unit to another unit
Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Shape, Dimension, and Geometric Relationships** "Objects in the plane and their parts and attributes can be analyzed" (CDE, 2009a, p. 107). 1. "Classify quadrilaterals and apply angle and side properties, including the sum of the interior angles" (p. 107). 2. "Apply properties of complementary, supplementary, and vertical angle relationships" (p. 107). 3. "Apply properties of parallel lines including corresponding angles and alternate interior angles" (p. 107).

	"Direct and indirect measurements can be used to describe and make comparisons" (108). 1. "Use properties of similar triangles to find unknown lengths" (p. 108). 2. "Use proportional reasoning to estimate distance, weight, and capacity" (p. 108). 3. "Use proportional reasoning to convert among measures including dimensional analysis" (p. 108).

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Target Dates: January 31- February 16 (11 Days)	
Chapter 6: *System of Equations*	
Section	Unit Objectives*
6.1.1-6.1.3	1. Translate written words to algebraic expressions/equations and conversely algebraic expression/equations to words (SD27J, 2007, p. 2). 2. Solve multi-step equations and inequalities and use them to solve problems (p. 2).
6.2.1-6.2.5	1. Translate written words to algebraic expressions/equations and conversely algebraic expression/equations to words (p. 2). 2. Solve systems of linear equations and inequalities and interpret their solutions (p. 2). 3. Solve systems of equation with two or more variables and apply to real world problems (p. 2). 4. Solve systems of linear equations and inequalities and interpret their solutions and their graphs (p. 2). 5. Choose and apply algorithms and appropriate methods in problem solving situations including mental math sub-problems models, x and y tables, estimation and reasonableness, [and] guess and check tables (p. 6).
6.3.1	1. Solve multi-step equations and inequalities and use them to solve problems (p. 2). 2. Solve systems of linear equations and inequalities and interpret their solutions and their graphs (p. 2). 3. Choose and apply algorithms and appropriate methods in problem solving situations including mental math sub-problems models, x and y tables, estimation and reasonableness, [and] guess and check tables (p. 6).
Skills Developed	Order of operations Solving for a variable other than *x* Working with multiple variables in one equation Solving Systems of Equations 4. Equal Value Method 5. Substitution 6. Elimination

Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Patterns, Functions, and Algebraic Structures** *"Properties of algebra, equality and inequality are used to solve linear equations and inequalities"* (CDE, 2009a, p. 63). 1. "Use the distributive, associative, and commutative properties to simplify algebraic expressions" (p. 63). 2. "Solve one-variable equations including those involving multiple steps, rational numbers, variables on both sides and the distributive property" (p. 63). 3. "Solve inequalities in one variable including negative coefficients and graph the solution on a number line" (p. 63). 4. "Represent the distributive property in a variety of ways including numerically, geometrically and algebraically" (p. 63).

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Target Dates: February 17- March 11 (14 Days)	
Chapter 7: Linear Relationships	
Section	Unit Objectives*
7.1.1-7.1.5	1. Explain the concept of slope (rate of change in a variety of given situations (SD27J, 2007, p. 2). 2. Use a graph to interpret rates of change (p. 3). 3. Interpret inequalities and their graphs in given situations (p. 3). 4. Use technology, such as a calculator or computer software, to enhance understanding of mathematical relationships (p. 6).
7.2.1-7.2.3	1. Write linear equations in slope-intercept or point-slope form and understand the patterns that create the linear relationship (p. 2). 2. Use various forms of data collection (p. 3). 3. Organize and construct data into tables, charts, graphs, lists and diagrams (p. 3).
7.3.1-7.3.4	1. Solve and write equation that require using properties of parallel and perpendicular lines (p. 2). 2. Graph linear equations using patterns, slope-intercept, point-slope, tables, ect. (p. 3). 3. Use technology, such as a calculator or computer software, to enhance understanding of mathematical relationships (p. 6).
Skills Developed	Find slope for a: 1. Graph 2. Equation 3. Two points Calculate the slope using the change in y over the change in x Find the relationship between parallel and perpendicular lines and their slopes Collect and organize data Find the line of best fit

Standards, Concepts and Skills, and Evidence Outcomes Addressed	**Patterns, Functions, and Algebraic Structures** "Linear functions model situations with a constant rate of change and can be represented algebraically, graphically, and using tables" (CDE, 2009a, p. 62). "Identify and interpret the slope (rate of change) and y-intercept in graphs, in tables, and from equation in slope-intercept form" (p. 62). "Properties of algebra, equality, and inequality are used to solve linear equations and inequalities" (p. 63). "Solve one-variable equations including those involving multiple steps, rational numbers, variables on both sides and the distributive property" (p. 63). "Graphs and tables can be used to distinguish between linear and nonlinear functions" (p. 64). "Explain the properties of linear function in tables and graphs" (p. 64). "Objects in the plane and their part and attributes can be analyzed" (p. 107). "Apply properties of parallel lines including corresponding angles and alternate interior angles" (p. 107).

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Target Dates: March 14-April 19 (18 Days: Includes CSAP [CDE, 2009b] Testing)	
Chapter 8: Quadratics	
Section	Unit Objectives*
8.1.1-8.1.4	1. Multiply and factor polynomials (SD27J, 2007, p. 2). 2. Solve quadratic equation and inequalities using various techniques including factoring strategies and the quadratic formula (p. 2).
8.2.1-8.2.5	1. Graph quadratic equations using patterns, tables, and various forms of the equation (p. 3). 2. Understand the relationship between graphs and equations, with a strong focus on linear and quadratic equations (p. 3). 3. Use graphing calculators to investigate both linear and non-linear functions (p. 6). 4. Use technology, such as a calculator or computer software, to enhance understanding of mathematical relationships (p. 6).
8.3.1-8.3.3	1. Solve quadratic equation and inequalities using various techniques including factoring strategies and the quadratic formula (p. 2). 2. Use graphing calculators to investigate both linear and non-linear functions (p. 6). 3. Use technology, such as a calculator or computer software, to enhance understanding of mathematical relationships (p. 6).
Skills Developed	Identify quadratic equations Factor quadratic equations Find the roots of quadratic equations Use one representation to create the other representation or representations
Standards, Concepts and Skills, and Evidence Outcomes Addressed	"Linear functions model situations with a constant rate of change and can be represented algebraically, graphically, and using tables" (CDE, 2009a, p. 62). 1. "Convert from one representation of a linear function to another, including situations, tables, equations (slope-intercept form) and graphs" (p. 62). 2. "Identify and interpret the slope (rate of change) and y-intercept in graphs, in tables, and from equation in slope-intercept form" (p. 62).

	"Properties of algebra, equality, and inequality are used to solve linear equations and inequalities" (p. 63). "Solve one-variable equations including those involving multiple steps, rational numbers, variables on both sides and the distributive property" (p. 63). "Graphs and tables can be used to distinguish between linear and nonlinear functions" (p. 64). "Explain the properties of linear function in tables and graphs" (p. 64).

* The Unit Objectives are a direct replication of the Success Criteria listed in the *Math Learning Map* for School District 27J and are on the page numbers listed.

Target Dates: April 18-May 6 (15 Days: Includes 3 Days for Final Review and 2 Days for Semester Final)	
Chapter 9: Inequalities	
Section	Unit Objectives*
9.1.1-9.1.2	1. Solve multi-step equations and inequalities and use them to solve problems (SD27J, 2007, p. 2). 2. Simplify and solve linear expressions, equations and inequalities using physical materials, calculators and computers (p. 2). 3. Solve quadratic equation and inequalities using various techniques including factoring strategies and the quadratic formula (p. 2).
9.2.1-9.2.3	Solve quadratic equation and inequalities using various techniques including factoring strategies and the quadratic formula (p. 2).
9.3.1-9.3.3	Solve systems of linear equations and inequities and interpret their solutions (p. 2).
Skills Developed	Indentify inequalities Translate story problems to mathematical sentences Graph inequalities on a number line Represent solutions of linear and nonlinear inequalities with two or more variables on a graph
Standards, Concepts and Skills, and Evidence Outcomes Addressed	"Linear functions model situations with a constant rate of change and can be represented algebraically, graphically, and using tables" (CDE, 2009a, p. 62). "Identify and interpret the slope (rate of change) and y-intercept in graphs, in tables, and from equation in slope-intercept form" (p. 62). "Properties of algebra, equality, and inequality are used to solve linear equations and inequalities" (p. 63). 1. "Use the distributive, associative, and commutative properties to simplify algebraic expressions" (p. 63). 2. "Solve one-variable equations including those involving multiple steps, rational numbers, variables on both sides and the distributive property" (p. 63). 3. "Solve inequalities in one variable including negative coefficients and graph the solution on a number line" (p. 63). 4. "Represent the distributive property in a variety of ways including numerically, geometrically, and algebraically" (p. 63).

	"Graphs and tables can be used to distinguish between linear and nonlinear functions" (p. 64). "Explain the properties of linear function in tables and graphs" (p. 64).

* The Unit Objectives are a direct replication of the Success Criteria listed in the *Math Learning Map* for School District 27J and are on the page numbers listed.

Chapter Summary

With all the knowledge students are required to have in order to be successful on CSAP (CDE, 2009b), it is important that teachers in Colorado thoroughly plan instruction that is aligned to state standards at each grade level. Presented in this chapter was a yearly instructional planning matrix for eighth grade mathematics teachers in School District 27J. The planning matrix included: (a) the chapters taught from *Algebra Connections* (Dietiker et al., 2006) with unit objectives, (b) the Colorado Academic Standards (CDE, 2009a), (c) concepts and skills students should develop (d) evidence outcomes addressed, (e) the skills developed, and (f) target dates. Mathematics teachers of eighth grade students should be better equipped to help students be successful on the content assessed on CSAP (CDE, 2009b), having all this information located in one central document.

Chapter 5

DISCUSSION

The purpose of this project was to create a yearly instructional planning matrix for implementation by eighth grade mathematics teachers in School District 27J. In order to complete this project, it was important to define curriculum and the importance of an aligned curriculum to student assessments, such as CSAP (CDE, 2009b). As the implementation of the Colorado Academic Standards (CDE, 2009a) takes place in school districts across Colorado, it is important to review the current curriculum used in the classrooms and align it to the new standards. Aligned curriculum insures that all students have access to knowledge that will make them successful at each grade level in the CSAP (CDE, 2009b).

Contributions of the Project

This project, the yearly instructional planning matrix, provides eighth grade mathematics teachers who teach *Algebra Connections* (Dietiker et al., 2006) with a scope and sequence that is aligned to the Colorado Academic Standards (CDE, 2009a) for the 2010-2011 school year. The scope and sequence includes materials and resources for standards that are not addressed in the current resources, *Algebra Connections* (Dietiker et al., 2006). The inclusion of this material with targets dates can help insure that students have exposure to all the standards before they take the CSAP (CDE, 2009b). Also, the purpose of the scope and sequence is to help teachers plan their instruction and

insure consistency with the curriculum pacing across the district. Thus, students who move between teachers or schools will have a greater chance of success.

Limitations of the Project

Although the yearly planning matrix provides information for eighth grade mathematics in School District 27J, there are three major limitations. The main limitation of this project is that the current Success Criteria (SD27J, 2007) came from the old standards. It is the intent of the mathematics coordinator to review and revise the Success Criteria, after the Implementation of the standards. Thus, the unit objectives may change because of the changes within the Colorado Academic Standards with the focus changing from grade bands to grade levels (CDE, 2009a). The second major limitation of this project is the author's lack of knowledge of *Algebra Connections* (Dietiker et al., 2006). Without teaching the curriculum in its entirety, it is difficult to know what each lesson is truly addressing. Having taught the full curriculum would have wholly enhanced the yearly planning matrix.

Peer Assessment

Overall, the peer assessment went well. Originally, the plan was to have the math coordinator and the principal review the yearly planning matrix. Due to time constraints, the mathematics coordinator was unable to review the project. The principal that reviewed the project felt that it was a good start to having curriculum alignment not only within one building but across the district. He was not able to provide detailed feedback on the planning matrix itself and suggested that past *Algebra Connections* (Dietiker et al., 2006) teachers review the project. Therefore, I had two previous eighth grade

mathematics teachers review the planning matrix along with a current eighth grade mathematics teacher and a seventh grade honors teacher.

All four of the teachers who reviewed the yearly planning matrix, agreed that the format was easy to follow. Having the target dates, unit objectives, and skills developed in each chapter was a definite plus. Again, all the teachers felt the pacing was reasonable, including for the fraction review and the geometry section. Getting through 9 of the 12 chapters would help students be successful in geometry. One of the reviewers stated that readiness is based on concepts and skills not chapters covered. Therefore, combining some of the lessons in the later chapters would help students with mastering some of the new concepts and skills. One of the reviewers felt that adding instruction on some geometry concepts would help students feel more comfortable as they enter geometry.

There was mixed reaction of the layout of geometry units. One of the reviewers felt there needed to be more detail included in the planning matrix, while another felt that there was enough information included in the planning matrix. One of the reviews suggested that two or more lesson plans for the geometry units be included. Yet, another review suggested including a brief description of each of the websites. The author has included a brief description of the websites listed in the geometry section and a sample lesson plan in order to improve the original project.

One of concept included on the CSAP (CDE, 2009b) is proportional reasoning. *Algebra Connections* (Dietiker et al., 2006) covers proportions at the end of most chapters. However, indirect measurement is not covered. The author thought about

putting all of the proportional reasoning sections together and adding a couple of lesson on indirect measurement. However, after presenting this idea the author has chosen not to proceed with this idea. The feedback on this idea was positive and very plausible. However, skipping around in the book may be very confusing for students and the creation of extra worksheets is necessary in order to make this work. Therefore, the author has chosen stay with the suggested sequence presented in *Algebra Connections* (Dietiker et al., 2006) and add indirect measurement with proportional reasoning into the geometry sections.

Overall, the peer assessment provided valuable feedback. Some of the feedback led to improving part of the yearly planning matrix and the inclusion of a geometry lesson. All of the reviewers suggested in their own way to not combine the proportional lessons into one unit, because of the amount of work that would be involved. Spreading out the instruction and practice allows students to have more practice time and instructional time throughout the year.

Recommendations for Future Research and Study

The researcher recommends implementation of the yearly planning matrix for the 2010-2011 school year. During implementation the researchers suggests that data collection be on summative assessments, thus allowing monitoring of implementation and student progress towards meeting evidence outcomes within the grade level standards. Over the course of a three year period, the research suggests that CSAP (2009b) data collection and analysis occur to insure that instruction is giving students the tools to be successful on standardized test.

Along with implementation of the yearly planning matrix, the eighth grade mathematics teachers should create common geometry lessons to be taught in January. This would help for teachers to teach using similar material and assess using a common assessment. Using a common resources and materials and a common assessment across the school district would help teachers in the analysis of standardized tests scores. After the analysis teachers would then come together to make adjustments in the curriculum to meet the needs of the students.

Project Summary

Curriculum alignment to the state and national standards is important for student success on standardized test. When the current curriculum or standards change, it is essential for teachers to align the curriculum to ensure that instruction is meeting the needs of students. This project began as a curriculum alignment to identify areas where instruction was missing, but turned out to be curriculum to the newly adopted Colorado Academic Standards (CDE, 2009a). The research was able to identify areas where instruction was lacking and added resources and sample lesson plans to address these areas. The main goal of the yearly instructional planning matrix is to ensure that all students in eighth grade in School District 27J are taught the content within each standard, which leads to success on the state standardized tests. When curriculum and the standards set forth by the state or nation are in alignment, students are more likely to experience success on standardized test.

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Appendix A

EVALUATION PROTOCOL

1. At first glance, is the layout of the yearly planning matrix easy to follow? Explain your reasoning for your choice.
2. Is the pacing for each chapter reasonable? In other words, is there enough time allotted to each chapter for students to grasp new concepts and have time to master new skills? Why or why not is the pacing reasonable?
3. Is there enough time allotted within each chapter to allow for flexible planning (i.e., field trips, pep assemblies, and school wide projects)? Explain your reasoning.
4. In the month of January, the yearly planning matrix includes two sections on geometry, which currently do not exist in our current resources. There are a few resources listed in these two sections. Has the author included enough resources in the geometry section to get teachers started in planning these two units on their own or within their own buildings? What other suggestions do you have for the author?
5. Should there be sample lessons for the geometry section included in the Appendices? Justify your reasoning for your answer.

6. How many chapters do eighth grade teachers need to cover for students to be able to comprehend the algebraic concepts needed in order to be successful any ninth grade geometry course?
7. Would it be possible to group the proportions sections of individual chapters together; thus, making a unit on proportions in which geometric figures could then be included? What are some of the benefits and limitations of creating an unit on proportions?
8. What are the strengths of this yearly planning matrix?
9. What are the limitations of this yearly planning matrix?
10. What suggestion do you have for improvement for the yearly planning matrix?

Appendix B

SIDE BY SIDE COMPARISON:
OLD STANDARDS AND THE NEW STANDARDS FOR MATHEMATICS

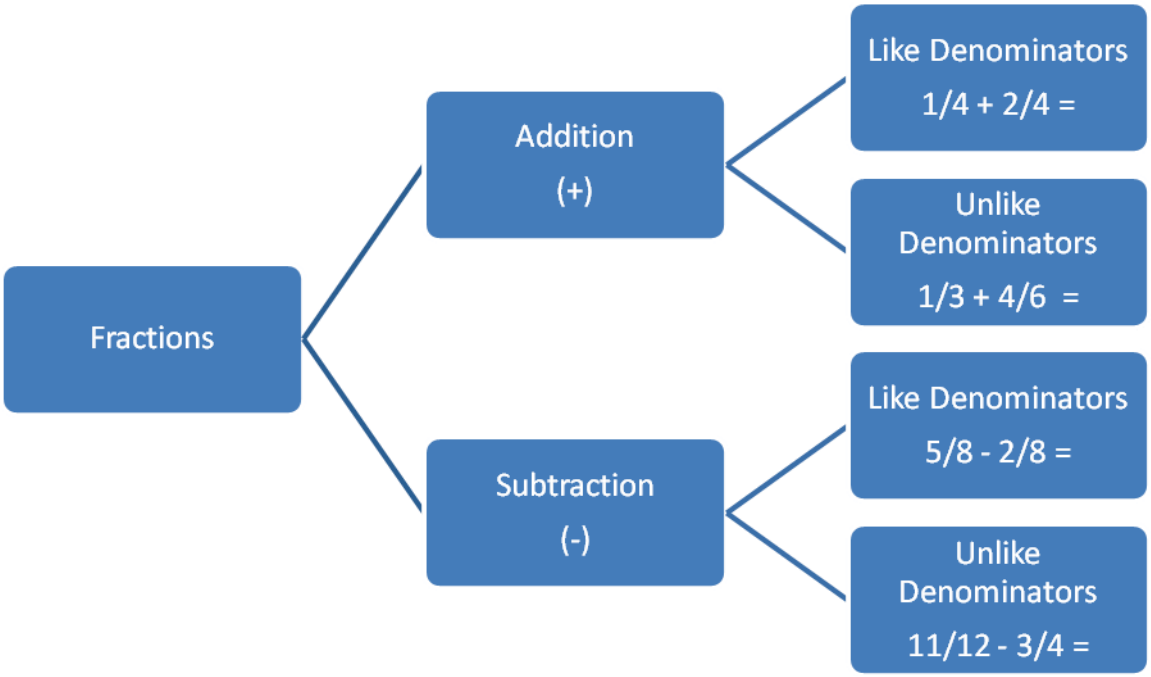
<table>
<tr><th>Colorado Model Content Standards for Eighth Grade Mathematics</th><th>Colorado Academic Standards for Eighth Grade Mathematics</th></tr>
<tr><td>Standard 1: Number Sense
“Students develop number sense and use numbers and number relationships in problem-solving situations and communicate the reasoning used in solving these problems” (CDE, 2005, p. 2).</td><td rowspan="2">Number sense, Properties, and Operations
1. In the real number system, rational and irrational numbers are in one to one correspondence to points on the number line (CDE, 2009a, p. 16).
2. Formulate, represent, and use algorithms with rational numbers flexibly, accurately, and efficiently (p. 16).</td></tr>
<tr><td>Standard 6: Computation
“Students link concepts and procedures as they develop and use computational techniques, including estimation, mental arithmetic, paper-and-pencil, calculators, and computers, in problem-solving situations and communicate the reasoning used in solving these problems” (CDE, 2005, p. 2).</td></tr>
<tr><td>Standard 2: Algebra
“Students use algebraic methods to explore, model, and describe patterns and functions involving numbers, shapes, data, and graphs in problem-solving situations and communicate the reasoning used in solving these problems” (CDE, 2005, p. 2).</td><td>Patterns, Functions, and Algebraic Structures
1. Linear functions model situations with a constant rate of change and can be represented algebraically, graphically, and using tables (CDE, 2009a, p. 16).
2. Properties of algebra, equality, and inequality are used to solve linear equations and inequalities (p. 16).
3. Graphs and tables can be used to distinguish between linear and nonlinear functions (p. 16).</td></tr>
</table>

<table>
<tr><td>Standard 3: Data Analysis and Probability
“Students use data collection and analysis, statistics, and probability in problem-solving situations and communicate the reasoning used in solving these problems” (CDE, 2005, p. 2).</td><td>Data Analysis Statistics, and Probability
Visual displays and summary statistics of two-variable data condense the information in data sets into usable knowledge (CDE, 2009a, p. 16).</td></tr>
<tr><td>Standard 4: Geometry
“Students use geometric concepts, properties, and relationships in problem-solving situations and communicate the reasoning used in solving these problems” (CDE, 2005, p. 2).</td><td rowspan="2">Shape, Dimension, and Geometric Relationships
1. Objects in the plane and their parts and attributes can be analyzed (CDE, 2009a, p. 16).
2. Direct and indirect measurements can be used to describe and make comparisons (p. 16).</td></tr>
<tr><td>Standard 5: Measurement
“Students use a variety of tools and techniques to measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems” (CDE, 2005, p. 2).</td></tr>
</table>

Appendix C

FRACTION REVIEW LESSONS

Every lesson is in alignment to the Colorado Academic Standards (CDE, 2009a). In order to insure that this continues, the Fraction Review Lessons are also in alignment to the Colorado Academic Standards (2009a). The design of the following graphic organizer is to help students understand the connections between each lesson. The graphic organizer severs as a reminder for the students of the steps used to solve different types of fraction problems. This visual aid addresses the needs of visual learners and should be referred to during the closure of each day's lesson.



Objectives:

Day 1:

1. By the end of today, you will create a SMART GOAL with a focus on improving your confidence with adding and subtracting fractions.
2. By the end of today, you will know how to compare fractions with unlike denominators.

Day 2:

By the end of today's lesson, you will be able to add fractions with like denominators.

Day 3:

By the end of today's lesson you will be able to add fractions with unlike denominators, by find equivalent fractions using the lowest common multiple.

Day 4:

By the end of today's lesson, you will be to subtraction fractions that have like denominators.

Day 5:

1. By the end of today's lesson you will be able to subtract fraction with unlike denominators, by finding equivalent fractions using the lowest common multiple.
2. By the end of today, you will compare your pre and post assessments scores and reflect on whether you met your SMART GOAL and where you will go from her.

Fraction Review Day 1

Title:	**Where are you now? What do you need to focus on? How do we compare fractions?**		
Content Area: Math (Fractions)		Grade: 8th grade	Duration: 50-minute period
Standard and Evidence Outcomes:	Number Sense, Properties, and Operations 1. "Compare and order sets of integers and rational numbers that are expressed as fractions, decimals, or percents" (CDE, 2009a, p. 27). 2. "Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals" (p. 28).		
Objectives:	• Students will use the SMART Goal worksheets to write an academic goal with a focus on adding and subtracting fractions. • Students will verbally explain how the different sized fraction pieces and how they relate to each other. • Students will identify and define equivalent fractions with 100% accuracy, after exploring fraction strips.		
Resources and Materials:	Pre/post assessment Highlighters for grading SMART Goal Worksheet Fraction strips (2 sets per student) http://www.teachervision.fen.com/tv/printables/0134356500_M1MUTM25.pdf Scissors Colored Pencils Envelopes (1 per student) Exit Ticket		
Differentiation:	Some students will need different colored strips. Having the students color their strips is a great way to get the strips colored. Students who have difficulty with fine motor skills may need other students to fold their fraction strips. Challenge students who can compare fractions with unlike denominators by having them compare fractions with larger denominators.		
Preparing Students for the Lesson: • Transitions • Expected Behaviors	Have students stand up if they feel they struggle with adding and/or subtracting fractions with unlike denominators. Thank the students for being open and honest and state that the next week is devoted to helping them develop the skills to become confident in how to find the sum and differences when fractions are part of the		

	problem and solution.
Teaching the Lesson (Lesson Sequence/ Activities): • Motivation/ Anticipatory Set • Pre-Assessment/ Activating Background Knowledge • Teacher Input, Modeling, & Checking for Understanding • Guided Practice • Independent Practice • Closure	Students will take a pre-test and grade the test. Students will then take then decipher their score. The first half of the test will be fractions with like denominators with both addition and subtraction. The second half of the test will consist of adding and subtracting fraction with unlike denominators. Based on the results students will write their SMART Goal to help them narrow down their focus for the week. Thirdly, students will cut out one of the sets of fractions strips and fold them into different size parts. In table groups, students will arrange the folded fractions strips from largest to smallest in size. Then students will discuss why the fraction size decreases as the denominator increases. *(Teacher should listen for the smaller the denominator the more pieces there are of the whole, making the each piece smaller.)* Through direct instruction, students will find other fraction pieces that are equal to each other, by comparing fraction strip sizes. For example, 2/3 is equal to 4/6 and 6/9. In pairs, student will find other fractions that are equivalent to 3/6 and ¼. After identifying other equivalent fractions student will define what an equivalent fraction with their shoulder partner. Students will summarize their learning for the day in their learning log and then complete their exit ticket.
Assessment:	1. The SMART Goal worksheet will be completed with a focus on improving one's skills in adding and subtracting fractions. 2. "How are the different sized-fraction pieces related to each other?" Students will write and verbally share their ideas about the above question with their shoulder partner. 3. As an exit ticket, students will write a definition for equivalent fractions and then list 3 sets of examples.
Notes & Reflections:	

Name_____

Date_____

Adding and Subtracting Fractions
Assessment

$\frac{1}{6} + \frac{6}{3} =$	$\frac{3}{10} + \frac{1}{10} =$	$\frac{6}{9} + \frac{3}{9} =$
$\frac{2}{10} + \frac{5}{10} =$	$\frac{3}{9} + \frac{5}{9} =$	$\frac{3}{10} + \frac{7}{10} =$
$\frac{9}{12} - \frac{2}{12} =$	$\frac{4}{12} - \frac{1}{12} =$	$\frac{7}{11} - \frac{6}{11} =$
$\frac{6}{9} - \frac{4}{9} =$	$\frac{9}{10} - \frac{5}{10} =$	$\frac{7}{9} - \frac{4}{9} =$
$\frac{2}{3} + \frac{3}{9} =$	$\frac{1}{2} + \frac{2}{3} =$	$\frac{2}{4} + \frac{1}{2} =$
$\frac{1}{2} + \frac{2}{3} =$	$\frac{1}{2} + \frac{3}{6} =$	$\frac{2}{6} + \frac{2}{3} =$
$\frac{1}{2} - \frac{1}{4} =$	$\frac{2}{3} - \frac{1}{2} =$	$\frac{1}{2} - \frac{2}{6} =$
$\frac{4}{5} - \frac{1}{2} =$	$\frac{2}{3} - \frac{5}{9} =$	$\frac{3}{4} - \frac{1}{2} =$

Name _____
Date_____

Smart Goal

EXAMPLE:
Specific: I will increase my computational skills with fractions.
Measurable: I will receive a score of 22/24 on the post assessment.
Action-Oriented: I will practice adding and subtracting fractions on www.aaamath.com.
Realistic: I'll probably never be great at subtracting fractions, but I will score a 100% on addition of fractions.
Timely: I will work on this for the next week.

Specific	
Measurable	
Action-Oriented	
Realistic	
Timely	

Reflection: How well did you do on meeting your goal? What will you do differently next time? What will you keep or do the same next time?

_____

_____

_____

Name_____

Date_____

Exit Ticket
Equivalent Fractions

What are equivalent fractions?-

_____

_____

_____

For each fraction below, name **three** other factions that are equivalent.

$\frac{3}{6}$	$\frac{2}{3}$	$\frac{3}{9}$
$\frac{9}{12}$	$\frac{1}{4}$	$\frac{4}{10}$

Fraction Review Day 2

Title:	**Adding Fractions with Like Denominators**		
Content Area: Math (Fractions)		Grade: 8th grade	Duration: 50-minute period
Standard and Evidence Outcomes:	Number Sense, Properties, and Operations "Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals" (CDE, 2009a, p. 28).		
Objectives:	In groups of 4, students will add fractions with like denominators using their fraction strips, with 80% accuracy.		
Resources and Materials:	Student Fraction Strips		
Differentiation:	Use larger denominators and numerators for students who already have a grasp of how to add fractions with like denominators. Ask these students to reduce their fractions to the smallest possible equivalent fractions. Pair high students with medium students have them teach each other.		
Preparing Students for the Lesson: • Transitions • Expected Behaviors	Write the problem 14/65 + 25/65. Explain to the student that by the end of today they will be able to solve this problem and others like this problem with 80% accuracy. In the lesson, there will be some direct instruction where you will take Cornell Notes and then there will be group work. At the end of the day you will be responsible for your learning by completing an exit ticket.		
Teaching the Lesson (Lesson Sequence/ Activities): • Motivation/ Anticipatory Set • Pre-Assessment/ Activating	Direct instruction: Teacher will ask the student to solve ¼ +3/4 using their fraction strips. Take a survey of what the students think the answer is and then explain how to find the using the fraction strips. Have the students compute the answer for 1/6 + 4/6. Take another quick survey to check for understanding. If students understand how to find the sum of fractions with like denominators have the students work on solving the five problems posted on the white board. ½ + ½=		

Background Knowledge • Teacher Input, Modeling, & Checking for Understanding • Guided Practice • Independent Practice • Closure	3/9 + 7/9= 5/8 + 1/8= 1/7 + 2/7= 2/3 + 1/3= Have student write in their learning log what they have learned in today's lesson and give one example.
Assessment:	As an exit ticket, students will add 10 sets of fractions with like denominators, with 80% accuracy. Bonus question is to find the sum of the problem on the board.
Notes & Reflections:	

Name_____

Date_____

Exit Ticket
Adding Fractions with Like Denominators

$\frac{1}{6} + \frac{6}{6} =$	$\frac{3}{10} + \frac{1}{10} =$
$\frac{2}{10} + \frac{5}{10} =$	$\frac{3}{9} + \frac{6}{9} =$
$\frac{6}{9} + \frac{6}{9} =$	$\frac{3}{10} + \frac{9}{10} =$
$\frac{7}{9} + \frac{4}{9} =$	$\frac{6}{11} + \frac{7}{11} =$
$\frac{4}{12} + \frac{1}{12} =$	$\frac{9}{12} + \frac{2}{12} =$

Fraction Review Day 3

Title:	**Adding Fractions with Unlike Denominators**		
Content Area: Math (Fractions)		Grade: 8th grade	Duration: 50-minute period
Standard and Evidence Outcomes:	Number Sense, Properties, and Operations "Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals" (CDE, 2009a, p. 28).		
Objectives:	Students will add fractions with unlike denominators using their fraction strips, with 80% accuracy.		
Resources and Materials:	Fraction Strips One note card per table with different addition of fractions with unlike denominators.		
Differentiation:	For students who are ready to move into the abstract world, pull them aside and show them how to find equivalent fractions by showing them how to find the LCM and equivalent fractions without using fractions strips. Have a note card with six fraction addition problems with unlike denominators for students to add, that cannot be done using their fraction strips. Have this particular group present last today since they are using a different method.		
Preparing Students for the Lesson: • Transitions • Expected Behaviors	Write the problem 13/24 + 1/12. Explain to the student that by the end of today they will be able to solve this problem and others like this problem with 80% accuracy. In the lesson, there will be some direct instruction where you will take Cornell Notes and then there will be group work. At the end of the day, you will be responsible for your learning by completing an exit ticket.		
Teaching the Lesson (Lesson Sequence/ Activities): • Motivation/ Anticipatory Set • Pre-Assessment/ Activating	Student will use their fraction strips to find common denominators for 1/6 and 1/3. Once a common denominator is identified, students will state the equivalent fraction and explain how they found it. Once the students have identified the equivalent fraction and have a common denominator then they will add the new fractions together. Complete two to three examples as a class in order to make sure the students understand that they have to find equivalent fractions before adding the numerators.		

Background Knowledge • Teacher Input, Modeling, & Checking for Understanding • Guided Practice • Independent Practice • Closure	Then, give the students 3 more problems to work on with their tablemates. The tables will present their thinking to a given problem, as assigned by the teacher. Groups will present answers and explanation of how they solved the problem to the class. Audience members will ask the presenting group clarifying questions if needed. At the end of the day students will write what they have learned in their learning log and complete the exit ticket for the day.
Assessment:	As an exit ticket, students will add 5 sets of fractions with unlike denominators.
Notes & Reflections:	

Name_____

Date_____

Exit Ticket
Adding Fractions with Unlike Denominators

$\frac{1}{2} + \frac{2}{3} =$	$\frac{2}{4} + \frac{1}{2} =$
$\frac{1}{2} + \frac{3}{6} =$	$\frac{1}{2} + \frac{2}{5} =$
$\frac{2}{6} + \frac{2}{3} =$	$\frac{2}{3} + \frac{3}{9} =$

Fraction Review Day 4

Title:	**Subtracting with Like Denominators**	
Content Area: Math (Fractions)	Grade: 8th grade	Duration: 50-minute period
Standard and Evidence Outcomes:	Number Sense, Properties, and Operations "Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals" (CDE, 2009a, p. 28).	
Objectives:	Students will subtract fractions with like denominators using their fraction strips, with 80% accuracy.	
Resources and Materials:	Fraction Strip Worksheet with several problems set of subtraction problems of fraction with like denominators.	
Differentiation:	For students who are struggling, pair them with a stronger student and have them complete the Kagan strategy where one person writes everything the other person is saying. When the person talking is done, the partner may ask questions of their partner about the steps and/or mathematical computation. The roles then reverse for the next problem.	
Preparing Students for the Lesson: • Transitions • Expected Behaviors	Write the problem 25/65 - 14/65. Explain to the student that by the end of today they will be able to solve this problem and others like this problem with 80% accuracy. In the lesson, there will be some direct instruction where you take Cornell Notes and then there will be group work. Then you will work on solving several problems with your tablemate. Each pair will present one of the problems on the worksheet to the class. At the end of the day you will be responsible for your learning by completing an exit ticket.	
Teaching the Lesson (Lesson Sequence/ Activities): • Motivation/ Anticipatory Set • Pre-Assessment/ Activating Background	Practice adding two or three fractions together with like denominators. Remind students that the same process will be used for subtracting fractions. In pairs, student will use their fraction strips to subtract fractions with like denominators. Give each pair of students a different problem to work on and present to the class. Audience members will write each problem and solve it before the pair presents the solution. This will help students to practice	

Knowledge • Teacher Input, Modeling, & Checking for Understanding • Guided Practice • Independent Practice • Closure	the problems and gain some feedback right away. At the end of the class student will write what they have learned in their learning logs and complete an exit ticket.
Assessment:	As an exit ticket, student will subtract 10 sets of fractions with like denominators.
Notes & Reflections:	

Name_____

Date_____

Subtracting Fractions with Like Denominators

$\frac{5}{11} - \frac{1}{11} =$	$\frac{2}{12} - \frac{1}{12} =$	$\frac{8}{10} - \frac{7}{10} =$
$\frac{4}{10} - \frac{4}{10} =$	$\frac{4}{12} - \frac{4}{12} =$	$\frac{8}{10} - \frac{5}{10} =$
$\frac{2}{11} - \frac{1}{11} =$	$\frac{6}{11} - \frac{1}{11} =$	$\frac{6}{11} - \frac{2}{11} =$
$\frac{11}{12} - \frac{4}{12} =$	$\frac{6}{10} - \frac{5}{10} =$	$\frac{9}{10} - \frac{1}{10} =$
$\frac{9}{11} - \frac{2}{11} =$	$\frac{4}{7} - \frac{2}{7} =$	$\frac{8}{9} - \frac{3}{9} =$
$\frac{9}{10} - \frac{2}{10} =$	$\frac{5}{11} - \frac{1}{11} =$	$\frac{11}{12} - \frac{3}{12} =$

Name_____

Date_____

Exit Ticket
Subtracting Fractions with Like Denominators

$\frac{3}{6} - \frac{3}{6} =$	$\frac{3}{10} - \frac{1}{10} =$
$\frac{5}{10} - \frac{2}{10} =$	$\frac{6}{9} - \frac{3}{9} =$
$\frac{6}{9} - \frac{4}{9} =$	$\frac{9}{10} - \frac{5}{10} =$
$\frac{7}{9} - \frac{4}{9} =$	$\frac{7}{11} - \frac{6}{11} =$
$\frac{4}{12} - \frac{1}{12} =$	$\frac{9}{12} - \frac{2}{12} =$

Fraction Review Day 5

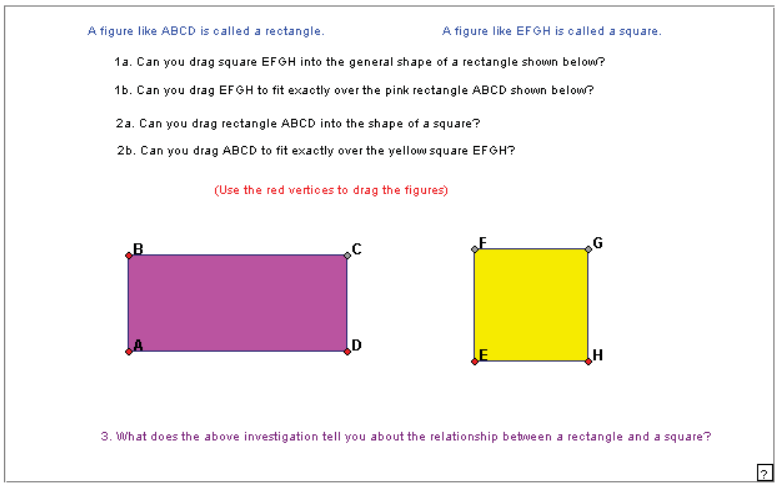
Title:	**The end of the road: subtracting fractions with unlike denominators and assessing our progress.**		
Content Area: Math (Fractions)		Grade: 8th grade	Duration: 50-minute period
Standard and Evidence Outcomes:	Number Sense, Properties, and Operations "Add, subtract, multiply and divide rational numbers including integers, positive and negative fractions and decimals" (CDE, 2009a, p. 28).		
Objectives:	1. Students will subtract fractions with unlike denominators using their fraction strips, with 80% accuracy. 2. Students will reflect on their learning of adding and subtracting fractions by filling out the reflection section of the SMART Goal Worksheet.		
Resources and Materials:	Fraction Strips Problems for students to solve at each station of the ten stations Individual Students' SMART Goal Worksheet Pre-assessment and score		
Differentiation:	There will be two sets of 10 stations. Students who feel they need more of a challenge will rotate through the blue stations and students who still feel they are struggling will rotate through the yellow stations.		
Preparing Students for the Lesson: • Transitions • Expected Behaviors	You have reached the end of our mini unit on adding and subtracting fractions. Today, we will work on subtracting fractions with unlike denominators. We will start by adding to our Cornell Notes and then work ten problems individually. You will score the work and turn it in today. The last half of the class we will be taking our post assessment and reflecting on our goals for this week. You will know if you met your goal for this week before you walk out of class today.		
Teaching the Lesson (Lesson Sequence/ Activities): • Motivation/ Anticipatory Set • Pre-Assessment/ Activating	During direct instruction, students will identify the steps of adding fraction with unlike denominators and translate the same process into subtracting fractions. During this time students will take Cornell Notes and write down the steps of how to find the difference between two fractions when the denominators are different. The teacher will work two to three examples on the board while the students write down the process. After direct instruction, students will rotate through 10 stations,		

Background Knowledge • Teacher Input, Modeling, & Checking for Understanding • Guided Practice • Independent Practice • Closure	solving 10 different problems involving subtraction fractions with unlike denominators. Students are to show their work as they solve these problems. Students will take the post assessment and self grade the assessment. Students will then compare today's assessment score to the 80% expectation and their previous score. Students will use the reflection part of the SMART Goal Worksheet to write a reflection on what they have learned and how they improved their skills in adding and subtracting fractions. Students who want to share their successes with the class may in the last five minutes of class. Students who share will be reward with an extrinsic reward.
Assessment:	1. The station work will be used as a formative assessment. Students will show work and have 80% of the problems answered correctly. 2. Students will accurately self-assess, by reflecting on their learning of the process of adding and subtracting fractions.
Notes & Reflections:	

Appendix D

SAMPLE GEOMETRY LESSON

Title:	**Can a rectangle be a square? Can a square be rectangle?**	
Content Area: Math (Geometry)	Grade: 8th grade	Duration: 50-minute period
Standard and Evidence Outcomes:	Shape, Dimension, and Geometric Relationships "Classify quadrilaterals and apply angle and side properties, including the sum of the interior angles" (CDE, 2009a, p. 107).	
Objectives:	"Make and test conjectures about geometric shapes and their properties" (SD27J, 2007, p. 5) Students will be able to identify the differences between a square and rectangle.	
Resources and Materials:	Computer Lab with internet access Paper and Pencil	
Differentiation:	For students who have difficulty writing have them work in pairs. For advanced students have them draw a Venn Diagram and lead the class discussion on the differences between a square a rectangle.	
Preparing Students for the Lesson: • Transitions • Expected Behaviors	Draw a square and a rectangle on the board. Assist students in having a brief discussion on what is the same and what is different about the square and the rectangle. Record the students' ideas on the board.	
Teaching the Lesson (Lesson Sequence/ Activities): • Motivation/ Anticipatory Set • Pre-Assessment/	Before students begin to explore the difference of a square and a rectangle have them write their own definition of the two shapes. Encourage the students to identify the differences between a square and a rectangle. Have the students work on the following website and answer the questions on their own piece of paper. http://math.kennesaw.edu/~mdevilli/quadclassify.html	

Activating Background Knowledge • Teacher Input, Modeling, & Checking for Understanding • Guided Practice • Independent Practice • Closure	Once students have had an opportunity to explore the differences between a square and a rectangle, have students review their answers to the questions in pairs. Then lead a whole class discussion on the difference between a square and rectangle. **Activity 1: Rectangle-Square Relationship**  (Villiers, 2008)
Assessment:	For an exit ticket or a learning log, have the students write their new definition of a square and a rectangle.
Notes & Reflections:	