

An In-depth Examination into the Intended, Implemented, and Attained
Curriculum of East Side Middle School in Anderson, Indiana

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Spring 2004

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Abstract:

The purpose of this paper is to look into the intended, implemented, attained curriculum of East Side Middle School in Anderson Indiana. The main question that is being looked into during the research and construction of this paper is the question of why schools have such low test scores when the standards are given for each teacher to follow throughout the year. This examination is to include three parts: a look into the curriculum that East Side Middle School has in place, and what guidelines are given for the teachers to follow when teaching this curriculum, a look into the actual curriculum that is getting taught inside the classrooms by the two seventh grade teachers, and a final look into the curriculum that is being attained by the students in both classes. This research culminates with a look into what can be done by the Anderson School Corporation to begin to align each curriculum accordingly so that all students have the best chance of learning the most material possible.

Acknowledgements:

- ❖ Thank you to Dr. Stump who was patient, wise, and understanding throughout the ups and downs of writing this paper.
- ❖ Thank you to all the faculty and staff and East Side Middle School for letting me come into your classrooms to observe and test. Without their full support, this paper would not have been possible.
- ❖ Thank you to all my family and friends who have been full of love and support throughout this process.
- ❖ Thank you to the entire mathematics education staff at Ball State University for providing me with the materials and knowledge needed for an exploration of this nature now and in the future.

Within an education system, there are three types of curriculum that are being developed simultaneously. These three types of curriculum are: the intended curriculum, the implemented curriculum, and the attained curriculum (Dossey, 31). Each of these three plays an important role in the development of the educational system and the education of the Nation's students.

The first type of curriculum is the intended, or official, curriculum. This is the desired curriculum based on the national standards and opinions of educators and experts in any given discipline (UNESCO, 1). These standards and opinions are then passed down to the school systems that then decide what topics of study will be taught in their classrooms. This curriculum is the concepts of study in a given discipline that school boards and educators *desire* to be in the classrooms. However, this curriculum can be altered by many different aspects of education, and this change results in the implemented curriculum.

The implemented curriculum is the areas of study that actually get carried out by the school's teachers and presented to the students (UNESCO,1). There are many factors that play a part in changing the intended curriculum into the implemented curriculum, such as the teachers themselves, available technology, and classroom environment. These factors have an impact on what areas of a particular concept is presented, the way it is presented, and the way in which it is tested. This curriculum is the topics of study that are in our classrooms everyday. It is the material that our students are presented with and

eventually tested on. This information will in turn dictate what information the students retain, which in turn develops the attained curriculum.

The final type of curriculum that plays an important role in the nation's educational system is the attained curriculum. This curriculum is the part of the intended and implemented curriculum that the students learn and are able to demonstrate (UNESCO, 1). This is the curriculum that gets tested by so many agencies to see what type of material our students are retaining and why. This does not just pertain to what the students were taught, but also what they are able to do on their own once outside the classroom.

If there were a correct alignment within these three types of curriculum, students within our schools would be able to perform to the ability that our nation's standards desire. However, somewhere in the education system, these standards and concepts get lost, and are turned into the curriculum that are students are actually being presented with inside their classrooms. This presented material in turn feeds the students with the knowledge they will then demonstrate and build the attained curriculum.

Therefore it is seen how one curriculum can develop another each is important to the overall education of the students. Another very large importance that cannot be overlooked is the fact that the attained curriculum is what gets studied and analyzed as far as the funding and federal aid a school system receives each year. The attained curriculum is what certain governmental agencies and other financial resources look at to determine the success of a school, and in turn, how much money they will receive to continue this success. Consequently, it is of great importance that the three curriculums align in order to give the students the best possible chance at meeting the intended

curriculum standards set by each school and in turn give each school system the greatest funding possible.

In order to do an examination into each type of curriculum, a school of study must first be established. The school that this document will focus on is one middle school within the Indiana public school system. East Side Middle School is located in Anderson, Indiana, and is the home to 811 sixth, seventh, and eighth-grade students (McCord, 1). The school is located within a suburban setting and has an ethnic breakdown of the following: 84% white, 11% black, 2% multi-racial, 1% Hispanic, 1% Asian, and 1% other. Free or reduced lunch is offered to 44% of East Side students, which is a nine percent increase from the previous year. Fifteen percent of the student body is involved in the special education program, with a majority of those students receiving assistance for learning disabilities (McCord, 2). Most of the special education students are self-contained except during lunch and in some cases physical education, health, fine arts, and practical art classes. All of the regular education students at East Side receive the same course of study at each grade level.

The discipline that will be studied as it pertains to the three types of curricula and the grade level is seventh grade mathematics. Within the seventh grade mathematics department at East Side Middle School, there are two teachers that work together to develop and present the material under the Indiana Standards. The teamwork of these two teachers, along with the experience of the other mathematics faculty and the administration is what forms the intended and implemented curriculum for East Side Middle School. As far as the attained curriculum, East Side Middle School chooses to use the Indiana Statewide Testing for Education Process exam to measure the attained

curriculum. This test is given to each student at the beginning of his or her eighth grade year to assess his or her attained knowledge from the previous academic year. This testing is what is used by the school to assess their students' knowledge throughout their educational careers.

The intended, implemented, and attained curriculum within East Side Middle School are each an important part in the success of the school's students. Each curriculum shapes and determines the next, and the success of one establishes the other. In order to understand the success of the students at East Side Middle School in relation to any assessment involving attained curriculum, it is important to first look at each curriculum separately, and then as a whole entity in order to establish the success of each student, and what can be changed in order to further this success.

The Intended Curriculum

Within the Anderson Indiana School system, the intended curriculum is based around the Indiana Standards, which are set up by the Indiana State School Board. These standards were formed by the Indiana State Board of Education to give Indiana schools guidelines to follow in the all of the subject areas taught within Indiana schools.

According to the Indiana Academic Standards, the standards are numbered according to grade, main standard number and order within the main standard. At East Side Middle School, one of three middle schools in the Anderson Indiana School system, the mathematics department has decided to allow these standards to shape their curriculum throughout the year.

According to the Indiana Department of Education, there are seven main standards that students in seventh grade should achieve. Number sense, computation,

algebra and functions, geometry, measurement, data analysis and probability, and problem solving are the standards Indiana has set for teachers of the seventh grade to cover. More specifically, there are sub-standards that describe in more detail the certain material that should be discussed from each main standard. The seventh grade mathematics department at Eastside Middle School has a plan to cover forty-three of these fifty-eight sub-standards within one school year.

These standards were chosen by the mathematics department of Anderson's school system so that the teachers can be focused on the principles that shape the Indiana Statewide Testing for Educational Progress. These tests, which are given in the third, sixth, eighth, and tenth grades, give the state an idea of how well each educational system within Indiana is teaching Indiana's students. These test results can shape budget plans and scholarship funds, and are therefore important to every Indiana school system. These standards are so important to the Anderson Indiana School system that they have chosen to base their middle school mathematics program around these standards.

The East Side Middle School seventh grade program has divided these sub-standards into six six-week periods, with the number of standards within a period depending on the complexity of the standards. The first six-week period is devoted to terminology of algebra and probability. The students are to cover integer powers, order of operations, data displays, and algebra terminology during this six weeks phase. There are nine sub-standards covered during this grading period, some of which coincide and can be interrelated into the same lesson. The mathematics department chose the sub-standards used within the beginning six weeks because the information taught is material that will be needed for many other units throughout the rest of the year.

The second six-week period concentrates on the properties of integers and graphing. This includes coordinate graphing, linear and nonlinear functions, and fundamental properties such as the commutative and distributive properties. Because of the difficulty of these mathematical concepts, there are only seven sub-standards for this six-week period. This allows for almost a week of study on each standard, according to East Side Middle School mathematics teachers. The seven sub-standards incorporated in this grading period are also concepts that will be necessary for the students to continue their seventh grade mathematics study.

The third six weeks only covers four sub-standards and focus on the notions of rational and irrational numbers. This includes computing square roots, prime factorization, and comparing rational and irrational numbers on a number line. This is the only set of six weeks in the East Side mathematics curriculum in which the sole focus is on the standards of number sense and computation. Plus, this six-week period closes out the semester and East Side and allows the students to shift focus from number and operation to an in-depth look at the other main standards listed.

The fourth six-week period has the students switch gears and focus on variables and geometry. Half of this six-week period introduces the classes to area, perimeter, surface area and volume of many three-dimensional figures. The remaining weeks move into the use of variables and how to solve equations with variables for a particular variable. This grading period is one that covers eight of the sub-standards given by the Indiana School Board, which means that this is a focused time for the students. This is also the only time that the students will discover the idea of variable, which will set them up for algebra later on in their mathematics career.

The fifth six-week period moves the students back into mathematical calculations for sometime, as well as looking into transformations. The students review how to multiply and divide fractions, learn how to use the increase and decrease of percentages, and explore discounts and markups. After these three standards, the students move into more geometry and learn about transformations, surface area, and volume. There is also a project that is completed by the students at the end of this six-week period that encompasses many of the standards covered this term. The project is one in which the students build a three dimensional solid. This activity has the students measure their dimensions, and find the surface area and volume for their shape. This requires the students to understand the concepts of surface area and volume, and also exposes them to multiplying or dividing fractions outside the lessons. This grading period is one that involves multiple mathematical concepts as they relate to one another. This is also a six-week period in which the students are only asked to explore five of the Indiana State sub-standards, which gives the students more time to focus on each given standard. There is much relation between standards and the students are asked to make connections between ideas, which requires more exploration and time for each sub-standard.

The final six-week period covers ten of the 43 sub-standards decided on by the East Side Middle School mathematics department. This intense study includes a discussion on slope, scale, the Pythagorean Theorem, and functions. These are concepts that are very important to the development of further mathematical skills, which means that students are required to think critically in this final period of their seventh grade mathematics study. While some of these ideas lend themselves to easy transitions, such as slope and the discussion of linear and nonlinear functions, many of the sub-standards

can seem fragmented to students, and forces them to be able to shift gears quickly, bringing all their mathematical skills to each new topic. Many of these ideas were saved for the final six-week period so that the material would be fresh for the students when they begin the eighth grade. During this six week period, the students are also required to take a final exam that encompasses all topics discussed throughout the year. This intense study makes for an extremely focused last six-week period for the students.

These standards, set by the East Side Middle School mathematics department, cover a majority of the standards set by the Indiana Department of Education. In fact, out of the 50 standards named in the Indiana Academic Standards, 43 of the standards are listed on the guide that both teachers use for the intended curriculum for the seventh grade mathematics study at East Side Middle School. However, all of the standards that are not listed on this framework come from the main Indiana standard of problem solving. These sub-standards include analyzing data, critical thinking about solutions, and making conjectures about concepts. The reason for this slight was given by one of the East Side mathematics teachers. The reply was that each of the problem solving standards should be incorporated into each six week period and therefore do not need to be listed on the framework of standards. While this reason may seem valid to some, it is very easy to see how these types of standards could be overlooked, especially when looking at all the standards that need to be covered within a given amount of time. If teachers are only given a six-week period to cover an average of seven sub-standards, it is very easy to see why the problem solving standards could be overlooked by some. However, the problem-solving standard is one that holds great importance in any attained curriculum measure, including the Indiana Statewide Testing for Educational Progress exams. This seems to

be the only deficiency within the standards that East Side Middle School covers within a given school year.

The Implemented Curriculum

Since the curriculum for seventh grade mathematics is simply set by the standards given by the Indiana Department of Education, there is much room for interpretation on what and how material should be presented to students. When the standards are read, they give a basic definition of what information students should know from their seventh grade mathematics course. However, they do not give guidelines on what specific information should be taught relating to a given topic.

For example, one topic that is discussed within the Indiana Academic Standards is the concept of slope. There are three standards that involve slope within the standards and they are 7.3.6, 7.3.7, and 7.3.8. Each standard gives a different definition of slope, and a way in which it can be examined through a different representation. This gives the two seventh grade mathematics educators guidelines in which to follow for the presentation of slope. However, since these three standards are the only information given to the teachers pertaining to slope, there is much room for interpretation left within each classroom. One topic of slope that was looked at by both classrooms was the concept of the slope-intercept form of an equation and the meanings of each number within that equation. After observations in both classrooms, it is evident how each teacher interpreted the standards given by the Indiana Department of Education.

Within the first classroom, which will be called classroom A, the class began with a problem of the day, which consisted of graphing an equation onto a coordinate plane. The students are first asked to look at equations and then graph them using the prior

knowledge they gained from the previous unit. They are then asked to find the slope of the line by using the rise over run method. The class did several other problems such as this on a note sheet. After six problems of this nature, the students were asked if they noticed any patterns. They then discovered the meaning of slope within an equation. Once the students understood how to find the slope of a line without graphing from the slope-intercept form, they were asked to make predictions about what the slope of lines with particular equations would be. They then checked their predictions using methods they were previously familiar with from prior lessons. This same technique was followed for the concept of the y -intercept. Practice problems followed and the students again made predictions about certain values given the equations. After this lesson, the students were able to recite the fact that the slope was the value given in front of the x in an equation and the y -intercept was the value not associated with the x . They were also presented with the fact that this was only true if the equation was in the specific slope-intercept form.

Each student then did practice problems individually and homework was assigned. Within the homework, the students were asked to identify the slope and y -intercept of each equation that was already given in slope-intercept form. They were also asked to match an equation to its appropriate graph and do the opposite by matching a graph to its appropriate equation. This presentation was all done within one class period and the students were to move onto a new topic the following day.

The teacher within classroom A chose to use a discovery approach in order for the students to make connections based on the slope-intercept form of an equation. The other presentation style, which was given in what will be called classroom B, took on a lecture

style approach. The class began by the teacher taking attendance and passing back materials. The students were then asked to get out their textbooks and turn to the section pertaining to the slope-intercept form of an equation. After a brief introduction discussing a reminder of what information the students had been working on the previous days, the students were asked to take 10 minutes to read over the section pertaining to the slope-intercept form of an equation. As the students read through the section, the teacher walks around the room to make sure all students are working. Once this reading is completed, the students were asked what information they read. Different concepts were named and put upon the chalkboard. After the class listed all possible concepts, the teacher began a lecture on the slope-intercept form of an equation. This lecture began with the introduction of the equation form:

$$y = mx + b$$

in which m was listed as the slope and b as the y -intercept. The teacher explained that the equation must be in this form in order for the slope and y -intercept to be identified. The class then practices naming the slope and y -intercept of different equations, all of which were in slope-intercept form, but had different positive and negative values. The teacher then moved to the overhead and discussed possible ways of graphing equations simply by looking at the y -intercept and slope within the equation. The students then practiced these methods and were assigned a homework set. This lesson was again presented in one day and the class was to move onto a new concept concerning slope the following day.

By looking at each of these classrooms individually, it appears that both have covered the topic of slope-intercept form of an equation in an in-depth manner. However, when one takes a look at both of the classrooms together, it is apparent that some topics

that were incorporated into one lesson were not included in another. This type of difference is what ensues when the curriculum is based on the Indiana Academic Standards. This information is what is needed in order to understand the attained curriculum and how well the implemented curriculum prepares the students of East Side Middle School for these tests.

The Attained Curriculum

In order to understand the impact of the differences in the two classrooms when looking the slope-intercept form of an equation, a measurement tool must be developed in order to determine the learned material in each classroom. The tool used for this study consisted of two questions pertaining to the slope-intercept form of an equation. The first question asked students to match a given line on a graph to the equation that correctly represents it. There were four possible equations, each with similar slopes and y -intercepts. This question was to ensure the students were familiar with the placement of the slope and y -intercept within an equation, and their meaning to a given graph.

For the second question, the students were given an equation and asked to graph using only the slope and y -intercept given in the equation. The students were also asked to make three points before connecting and producing a line. This question would allow the students to not only demonstrate their knowledge of where the slope and y -intercept were in a given equation, but also how to execute these concepts and create an alternate representation of the line.

These two questions were asked of both classrooms one week after the classroom teachers covered the material. Each class was given approximately ten minutes to complete both questions and no notes were permitted during this time. Each question was

then assessed and given a score of zero for an incorrect answer, or a score of one for a correct answer. All aspects of the question must have been correct in order to receive a score of one. Once all the questions were graded, the scores were put into a spreadsheet and compared by classroom.

Classroom A consisted of twenty-four students the day the assessment took place. Of those students present, 75% answered the first question correctly, while only 37.5% of the students answered the second question exactly. Classroom B had twenty-eight students present during the assessment. However, 33.3% of these students answered the first question correctly, while 62.5% got a perfect score on the second question.

While all of these numbers seem low when thinking about how much the students actually learned about the topic, it is important to remember what material and how it was presented within the classroom. In classroom A, much of the time was spent on identifying the meaning of the slope and the y -intercept within a given equation. The students were then given a chance to match certain graphs to a choice of equations, and vice versa. This type of practice is exactly the type of problem that was given within question one, which 75% of the students in classroom A answered correctly. However, during the day's lesson over the slope-intercept form of an equation, the students did not receive practice with graphing a given equation using only the slope and y -intercept given in the known information. This is the type of problem that was given in the second question, which significantly less than half the class answered correctly.

This type of analysis shows a very significant fact about what the students were able to learn from the slope-intercept lesson in classroom A. The students in this classroom were able to identify the slope and y -intercept of a line, and then were able to

plug these numbers into their appropriate spaces in the slope-intercept form. This shows that they understood what the numbers in a given equation represented and how the graph related to the equation. However, the students were not able to translate this representation on their own. They were able to see the numbers within the equation and know what those numbers represented in accordance with a graph, but they were not able to fully translate the equation into a new representation. This analysis shows that while the students were able to grasp the fundamental aspects of the slope-intercept form of an equation, they were unable to take those basics and move further into a full interpretation.

Classroom B, on the other hand, took a different approach to the slope-intercept equation approach, and got different results as well. As discussed before, classroom B allowed the students to read the section discussing the new material, after which the teacher spoke about the new topic, and the students then did practice problems in which they were to use the information given within an equation, the slope and the y -intercept, to graph lines. This gave the students much exposure to the second type of question that was asked during the assessment, but no exposure to the first. This fact is one reason why the students did not score highly on the first question, which only 33.3% of the class passed. However, this fact does not explain why only 46.4% of the students passed the type of question that was presented during the day's lesson concerning the slope-intercept form of an equation.

There are many possible explanations for why the students in each classroom did poorly. First of all, one reason may be that since only one day was spent on the topic, students were unable to fully grasp all facets of the concept at one time. Also, there are many times in which outside distractions hinder a child from fully concentrating on a

given subject, and allowing only one day for a given topic greatly decreases the chances of catching lost students. Also one day can only allow one presentation style, which limits the learning styles that the lesson can cater to. This type of topic is one that is too large to be covered thoroughly within one day's time, and with few guidelines on how to spend the time given, it is hard for teachers to fully cover and then assess their students on such a topic.

Conclusion

The current attained curriculum that the Anderson Community School System follows is the Indiana Statewide Testing for Educational Progress exams. These present scores for East Side Middle School have stayed consistent throughout the last seven years. The school's pass percentage in 1997 was 57.0%, and the percentage passing in 2003 is currently 58.9%. However, these two numbers are low compared to the state average of 71%. In order to bring these scores up, it is important to take a look at the type of curriculum being presented at East Side and see how it aligns with the curriculum that is needed for success on the statewide tests.

From taking an in-depth look at each type of curriculum associated with East Side Middle School in Anderson Indiana, there are many conclusions that can be drawn in order to not only improve the intended curriculum, and in turn, the attained. To begin with the intended curriculum, in order to fully allow the students complete access to all information that may be presented on any assessment, it is imperative that the students are exposed to all the Indiana state standards. This not only includes the content standards one through six, but most importantly the problem solving standard and all of its sub-

standards. Each standard must be covered in a timely fashion and ideally in conjunction with other standards as well. The type of disjunction that is created by the type of framework presented at East Side makes it hard for students to make connections between previous and new material. If each standard could be covered and related to other standards and real-life situations, the intended curriculum would fully cover the information given on statewide tests.

In regards to the implemented curriculum, it is crucial for the East Side Middle School mathematics department to develop a more in-depth strategy towards curriculum. As seen with the example of the slope-intercept form of an equation, the standards are a guideline for curriculum, but when used alone can leave room for much interpretation. The use of a textbook or other supplemental material could be of assistance, but would not be necessary if both teachers could not come to an agreement. However, in order to make the necessary changes in the implemented curriculum, which in turn would change the attained curriculum, is to have set guidelines as to what material should be covered, when the material should be covered, and in some instances, how the material should be covered.

Finally, the attained curriculum is one area in which one change could make a huge difference in the success of the East Side students. This curriculum could be improved if more problem solving strategies and techniques were presented to the students early on and consistently throughout the school year. So much of the tool that East Side largely uses to measure their attained curriculum, the Indiana Statewide Testing for Educational Progress exams, uses many problem-solving abilities that are essential for

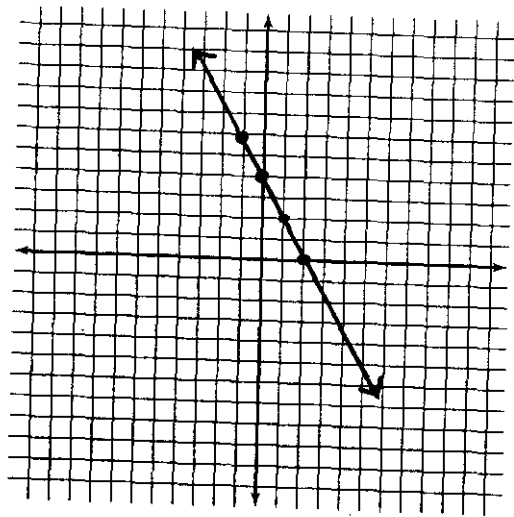
success in any assessment. This and the use of possible test taking strategies throughout the year would greatly improve the scores at East Side Middle School.

The three types of curriculum are important for the understanding of the full knowledge that students are receiving within a given year. It is evident that each curriculum is based on another and the success of all three depends on structure of each. These three curriculum types are well developed within East Side Middle School as it pertains to seventh grade mathematics. However, there are improvements that need to be made in order to give East Side students the best chance to succeed. In order to fully understand the changes that need to be met within this curriculum, each type of curriculum needed to be explored to the fullest. Now that this examination has been made, it would be in the best interest of the mathematics students at East Side for the three types of curriculum to be explored by the school in order to give all students the best chance at success.

Name _____

Date _____

Given the graph below, find the equation that describes the given line. Circle the letter of your answer. Then explain how you made your choice (2 sentences).



a. $y = -2x + 4$

b. $y = -\frac{1}{2}x + 4$

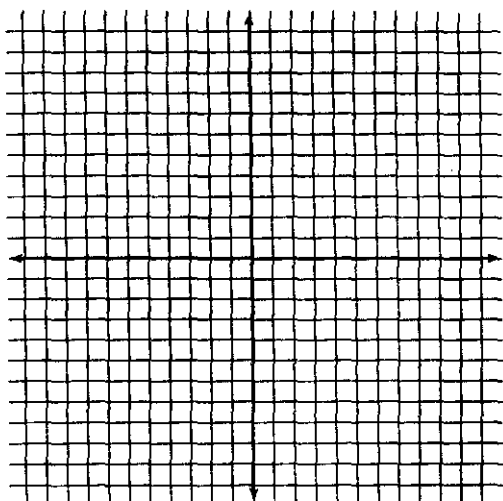
c. $y = \frac{1}{2}x - 4$

d. $y = 2x - 4$

Explanation:

Graph the following equation using only the slope and y-intercept. DO NOT make a chart of values. Graph your line making at least 3 points before graphing.

$$y = \frac{3}{4}x - 2$$



Appendix One: Curriculum Framework for Seventh Grade Mathematics at East Side Middle School

First Six Weeks:

- 7.1.4 Understand and compute whole number powers of whole numbers.
- 7.3.3 Use correct algebraic terminology, such as variable, equation, term, coefficient, inequality, expression, and constant.
- 7.3.4 Evaluate numerical expressions and simplify algebraic expressions by applying the correct order of operations and the properties of rational numbers.
- 7.6.1 Analyze, interpret, and display data in appropriate bar, line, and circle graphs and stem-and-leaf plots, and justify the choice of display.
- 7.6.2 Make predictions from statistical data.
- 7.6.4 Analyze data displays, including ways that they can be misleading. Analyze the way in which the wording of questions can influence survey results.
- 7.6.5 Know that if P is the probability of an event occurring, then $1-P$ is the probability of that event not occurring.
- 7.6.6 Understand that the probability of either one or the other of two disjoint events occurring is the sum of the two individual probabilities.
- 7.6.3 Describe how additional data, particularly outliers, added to a data set may affect the mean, median, and mode.

Second Six Weeks:

- 7.2.1 Solve addition, subtraction, multiplication, and division problems that use integers, fractions, decimals, and combinations of the four operations.
- 7.3.4 Evaluate numerical expressions and simplify algebraic expressions by applying the correct order of operations and the properties of rational numbers.
- 7.4.1 Understand coordinate graphs and use them to plot simple shapes, find lengths and areas related to the shapes and find images under translations, rotations, and reflections.
- 7.3.8 Draw a graph of a line given the slope and one point on the line, or two points on the line.
- 7.3.5 Solve an equation or formula with two variables for a particular variable.
- 7.3.7 Find a slope of a line from its graph.
- 7.1.6 Understand and apply the concept of square root.

Third Six Weeks:

- 7.1.5 Find the prime factorization of whole numbers and write the results using exponents.
- 7.2.1 Solve addition, subtraction, multiplication, and division problems that use integers, fractions, decimals, and combinations of the four operations.
- 7.1.6 Understand and apply the concept of square root.

- 7.1.2 Compare and order rational and common irrational numbers and place them on a number line.
- 7.1.1 Read, write, compare, and solve problems using whole numbers in scientific notation.
- 7.2.4 Use estimation to decide whether answers are reasonable in problems involving fractions and decimals.
- 7.5.1 Compare lengths, areas, volumes, weights, capacities, times, and temperatures within measurement systems.
- 7.3.5 Solve an equation or formula with two variables for a particular variable.
- 7.4.1 Understand coordinate graphs and use them to plot simple shapes, find lengths and areas related to the shapes and find images under translations, rotations, and reflections.
- 7.3.1 Use variables and appropriate operations to write an expression, a formula, an equation, or an inequality that represents a verbal description.
- 7.3.2 Write and solve two-step linear equations and inequalities in one variable and check the answers.
- 7.5.4 Use formulas for finding the perimeter area of basic two-dimensional shapes and the surface area and volume of basic three-dimensional shapes, including rectangles, parallelograms, trapezoids, triangles, circles, right prisms, and cylinders.

Fifth Six Weeks:

- 7.4.2 Understand the transformations preserve the length of segments, and that figures resulting from slides, turns, and flips are congruent to the original figures.
- 7.2.1 Solve addition, subtraction, multiplication, and division problems that use integers, fractions, decimals, and combinations of the four operations.
- 7.2.2 Calculate the percentage increase and decrease of a quantity.
- 7.2.3 Solve problems that involve discounts, markups, tax, and commissions.
- 7.5.6 Use objects and geometry modeling tools to compute the surface area of the faces and the volume of a three-dimensional object built from rectangular solids.

Sixth Six Weeks:

- 7.5.4 Use formulas for finding the perimeter area of basic two-dimensional shapes and the surface area and volume of basic three-dimensional shapes, including rectangles, parallelograms, trapezoids, triangles, circles, right prisms, and cylinders.
- 7.5.5 Estimate and compute the area of more complex or irregular two-dimensional shapes by dividing them into more basic shapes.
- 7.1.3 Identify rational and common irrational numbers from a list.
- 7.4.3 Know and understand the Pythagorean Theorem and use it to find the length of the missing side of a right triangle and the lengths of the other segments. Use direct measurement to test conjectures about triangles.
- 7.4.4 Construct two-dimensional patterns for three-dimensional objects, such as right prisms, pyramids, cylinders, and cones.
- 7.5.2 Use experimentation and modeling to visualize similarity problems. Solve problems

using similarity.

- 7.5.3 Read and create drawings made to scale, construct scale models, and solve problems related to scale.
- 7.3.6 Define slope as vertical change per unit of horizontal change and recognize that a horizontal line has a constant slope or rate of change.
- 7.3.9 Identify functions as linear or nonlinear and examine their characteristics in tables, graphs, and equations.
- 7.3.10 Identify and describe situations with constant or varying rates of change and know that a constant rate of change describes a linear function.

Appendix 2: Indiana Department of Education Standards for Seventh Grade Mathematics

Standard 1: Number Sense

- 7.1.1 Read, write, compare, and solve problems using whole numbers in scientific notation.
- 7.1.2 Compare and order rational and common irrational numbers and place them on a number line.
- 7.1.3 Identify rational and common irrational numbers from a list.
- 7.1.4 Understand and compute whole number powers of whole numbers.
- 7.1.5 Find the prime factorization of whole numbers and write the results using exponents.
- 7.1.6 Understand and apply the concept of square root.
- 7.1.7 Convert terminating decimals into reduced fractions.

Standard 2: Computation

- 7.2.1 Solve addition, subtraction, multiplication, and division problems that use integers, fractions, decimals, and combinations of the four operations.
- 7.2.2 Calculate the percentage increase and decrease of a quantity.
- 7.2.3 Solve problems that involve discounts, markups, tax, and commissions.
- 7.2.4 Use estimation to decide whether answers are reasonable in problems involving fractions and decimals.
- 7.2.5 Use mental arithmetic to compute with simple fractions, decimals, and powers.

Standard 3: Algebra and Functions

- 7.3.1 Use variables and appropriate operations to write an expression, a formula, an equation, or an inequality that represents a verbal description.
- 7.3.2 Write and solve two-step linear equations and inequalities in one variable and check the answers.
- 7.3.3 Use correct algebraic terminology, such as variable, equation, term, coefficient, inequality, expression, and constant.
- 7.3.4 Evaluate numerical expressions and simplify algebraic expressions by applying the correct order of operations and the properties of rational numbers.
- 7.3.5 Solve an equation or formula with two variables for a particular variable.
- 7.3.6 Define slope as vertical change per unit of horizontal change and recognize that a horizontal line has a constant slope or rate of change.
- 7.3.7 Find a slope of a line from its graph.
- 7.3.8 Draw a graph of a line given the slope and one point on the line, or two points on the line.
- 7.3.9 Identify functions as linear or nonlinear and examine their characteristics in tables, graphs, and equations.

- 7.3.10 Identify and describe situations with constant or varying rates of change and know that a constant rate of change describes a linear function.

Standard 4: Geometry

- 7.4.1 Understand coordinate graphs and use them to plot simple shapes, find lengths and areas related to the shapes and find images under translations, rotations, and reflections.
- 7.4.2 Understand the transformations preserve the length of segments, and that figures resulting from slides, turns, and flips are congruent to the original figures.
- 7.4.3 Know and understand the Pythagorean Theorem and use it to find the length of the missing side of a right triangle and the lengths of the other segments. Use direct measurement to test conjectures about triangles.
- 7.4.4 Construct two-dimensional patterns for three-dimensional objects, such as right prisms, pyramids, cylinders, and cones.

Standard 5: Measurement

- 7.5.1 Compare lengths, areas, volumes, weights, capacities, times, and temperatures within measurement systems.
- 7.5.2 Use experimentation and modeling to visualize similarity problems. Solve problems using similarity.
- 7.5.3 Read and create drawings made to scale, construct scale models, and solve problems related to scale.
- 7.5.4 Use formulas for finding the perimeter area of basic two-dimensional shapes and the surface area and volume of basic three-dimensional shapes, including rectangles, parallelograms, trapezoids, triangles, circles, right prisms, and cylinders.
- 7.5.5 Estimate and compute the area of more complex or irregular two-dimensional shapes by dividing them into more basic shapes.
- 7.5.6 Use objects and geometry modeling tools to compute the surface area of the faces and the volume of a three-dimensional object built from rectangular solids.

Standard 6: Data Analysis and Probability

- 7.6.1 Analyze, interpret, and display data in appropriate bar, line, and circle graphs and stem- and-leaf plots, and justify the choice of display.
- 7.6.2 Make predictions from statistical data.
- 7.6.3 Describe how additional data, particularly outliers, added to a data set may affect the mean, median, and mode.
- 7.6.4 Analyze data displays, including ways that they can be misleading. Analyze the way in which the wording of questions can influence survey results.

- 7.6.5 Know that if P is the probability of an event occurring, then $1-P$ is the probability of that event not occurring.
- 7.6.6 Understand that the probability of either one or the other of two disjoint events occurring is the sum of the two individual probabilities.
- 7.6.7 Find the number of possible arrangements of several objects using a tree diagram.

Standard 7: Problem Solving

- 7.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, identifying missing information, sequencing, and prioritizing information, and observing patterns.
- 7.7.2 Make and justify mathematical conjectures based on a general description of a mathematical question or problem.
- 7.7.3 Decide when and how to divide a problem into simpler parts.
- 7.7.4 Apply strategies and results from simpler problems to solve more complex problems.
- 7.7.5 Make and test conjectures by using inductive reasoning.
- 7.7.6 Express solutions clearly and logically by using the appropriate mathematical terms and notations. Support solutions with evidence in both verbal and symbolic work.
- 7.7.7 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree.
- 7.7.8 Select and apply appropriate methods for estimating results for rational-number computations
- 7.7.9 Use graphing to estimate solutions and check the estimates with analytic approaches.
- 7.7.10 Make precise calculations and check the validity of the results in the context of the problem.
- 7.7.11 Decide whether a solution is reasonable in the context of the original situation.
- 7.7.12 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.