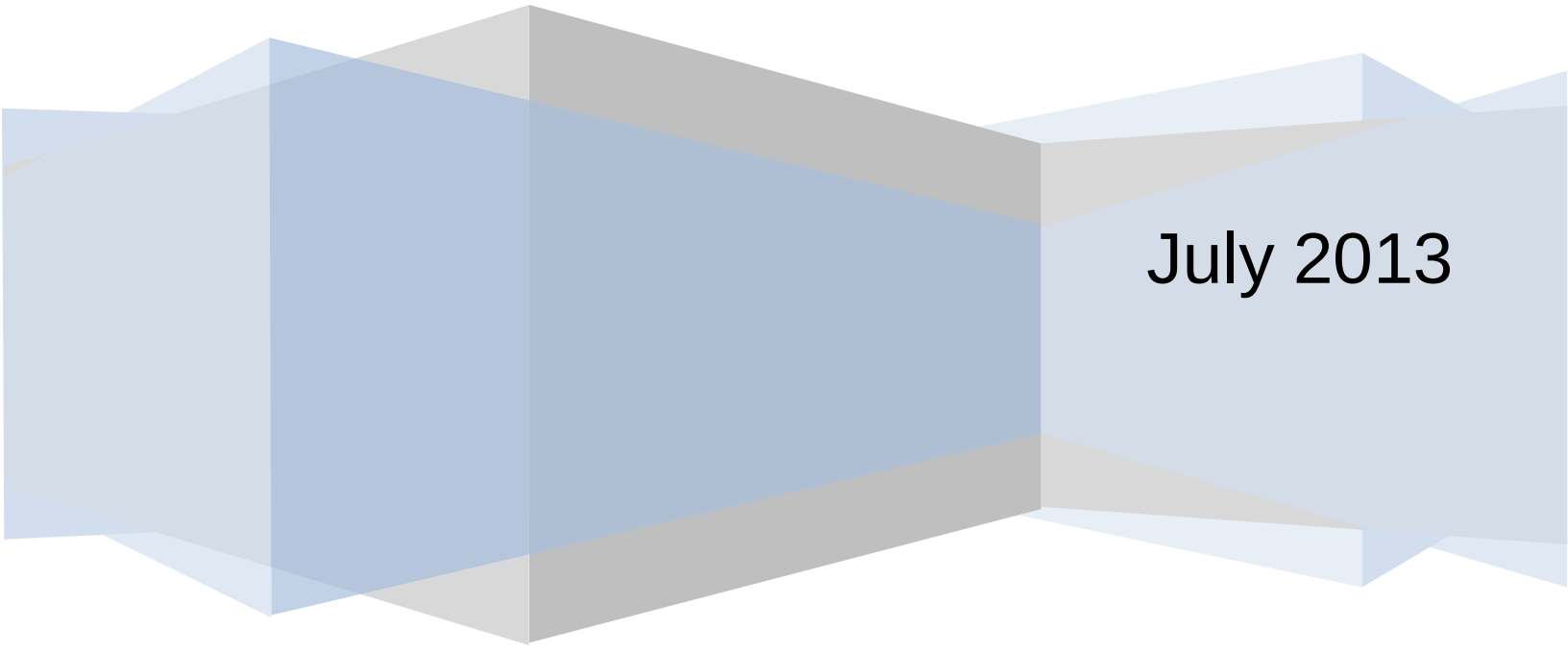
Comparison of the Common Core and 2004 Georgia Math Standards

Dr. Mary Kay Bacallao
Mathematics Professor
Tift College of Education, Mercer University



July 2013

Table of Contents

About The Author

Dr. Mary Kay Bacallao has taught math for 25 years and currently serves as a professor of math and science education at Mercer University. Formerly, she was Associate Professor at St. Thomas University. She has taught math methods for pre-service and in-service teachers since 1996. She has made frequent presentations at the regional conferences and annual meetings of the National Council of Teachers of Mathematics as well as Georgia's State Math Conference at Rock Eagle. She has served on several content review panels for the Georgia Professional Services Commission. Her work has been published in many professional journals and conference proceedings. Dr. Bacallao earned her Doctorate in Education from Florida Atlantic University. She is currently a mathematics professor at Tift College of Education at Mercer University.

Executive Summary

This report responds to the request by State Senator William Ligon of Georgia for a comparison of the 2004 Georgia Performance Standards in math with the Common Core State Standards in math. This comparison is provided in order to show legislators, education policy makers, parents, and all interested Georgia citizens that Common Core math weakens this state's K-12 curriculum standards.

In order to create this report, I have selected items from the Georgia Performance Standards and Common Core that best highlight the differences. The detailed analysis compares every former K-8 Georgia Performance Standard in math with the Common Core equivalent by grade level in all the math content areas; including: (1) Number and Operations (2) Algebra (3) Geometry (4) Measurement and (5) Data Analysis and Probability. An exhaustive analysis of the GPS and Common Core math standards reveals why the Common Core math standards will result in students falling one to two years behind what they were able to accomplish under the previous Georgia Performance Standards.

What is missing in the new Common Core Math Standards? Here are a few examples:

1. Data analysis tools such as mean, median, mode, and range -- gone in elementary grades.
2. The concept of pi, including area and circumference of circles – gone in elementary grades.
3. The Fundamental Theorem of Arithmetic (prime factorization) – gone completely.
4. Using fractions, decimals, and percents interchangeably -- gone completely.
5. A central concept of measurement – density, is gone completely and measurement is not taught separately after 5^{th} grade.
6. Division of a fraction by a fraction, a key component to number sense – gone in elementary grades.
7. Only three of the five standard congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL) are included in the standards.
8. Algebra -- inadequate readiness in the elementary grades and pushed back one year (from middle school – 8^{th} grade – to high school – 9^{th} grade). This means the majority of Georgia students will not reach calculus in high school, as expected by selective universities.
9. Geometry -- inadequate readiness in the elementary and middle grades. Simple elementary concepts such as calculating the areas of triangles, parallelograms and polygons have been removed from the elementary grades. These concepts serve as the foundation for the development of geometric thinking and have always been important elementary school level concepts.

When reviewing the Thomas B. Fordham Institute's comparison of the standards, Georgia's strong rating of an A- confirms what I was easily able to ascertain. The Fordham report identifies particular strengths in the previous Georgia Performance Standards that are not adequately addressed under Common Core. For example, Fordham notes that "the development of the concept of area is strong as is illustrated by the following sequence: …Derive the formula for the area of a parallelogram (grade 5) Derive the formula for the area of a triangle (grade 5) Find the areas of triangles and parallelograms using formulae (grade 5)." Ironically, these very standards are no longer part of elementary instruction in Common Core math. If Common Core math continues, Georgia elementary students will only be asked to calculate the area of squares or rectangles, traditionally a third grade level skill. Under Common Core math, Georgia fifth

graders will be classifying two-dimensional figures instead of calculating the area of those figures.

The Fordham report praises the Georgia Performance Standards, “Geometry is also well covered. Foundations are included and standard theorems are covered, for example: Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL) (Mathematics 1).”

However, the Common Core math standards emphasize understanding congruence in terms of rigid motions to “Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions,” eliminating two of the standard theorems praised by the Fordham report.

As a mathematics education professor and former teacher of elementary math, I am concerned that Georgia students are not being challenged. Our students are capable of so much more than what Common Core math requires.

To fully research the information for this report, I also went line by line with the well-researched National Council of Teachers of Mathematics Standards from 2000 and the former Massachusetts State Standards. Based on a comparison of those standards to the GPS and the Common Core math standards, I make the following recommendations:

1. Georgia's previous standards are one to two years ahead of the Common Core math standards, therefore the Georgia Performance Standards in math are clearly superior and should be re-instated with some modifications.
2. The former Massachusetts State standards should be examined to determine areas where the Georgia Performance Standards in math can be strengthened.
3. Math standards from high achieving countries should be used as a basis for comparison as modifications are made to the Georgia Performance Standards for math.
4. Mathematics testing should accurately pinpoint the level of current mathematics understanding for the purpose of improving instruction for every student. A growth model of assessment is not possible with the current criterion referenced testing system. To measure growth, a mathematics placement test should be used. These tests are not expensive. Placement tests can serve to recognize student accomplishments in mathematics and encourage all students to fulfill their mathematics potential.

A Comparison of Math Standards: Numbers and Operations

	Georgia Performance Standards, 2004	Common Core Math, 2013
Pre-Kindergarten to Kindergarten	MKN1. Students will connect numerals to quantities they represent. A. Count a number of objects up to 30. B. Produce models for number words through ten. C. Write numerals through 20 to label sets. D. Sequence and identify using ordinal numbers (1st -10th). E. Compare two or more sets of objects (1-10) and identify which set is equal to, more than, or less than the other. F. Estimate quantities using five and ten as a benchmark. (e.g. 9 is one five and four more. It is closer to 10, which can be represented as one ten or two fives, than it is to five.) G. Use informal strategies to share objects equally (divide) between two or three people or sets. H. Identify coins by name and value (penny, nickel, dime, and quarter). I. Count out pennies to buy items that together cost less than 30 cents. J. Make fair trades using combinations involving pennies and nickels and pennies and dimes. MKN2. Students will use representations to model addition and subtraction. A. Use counting strategies to find out how many items are in two sets when they are combined, separated, or compared. B. Build number combinations up to 10 (e.g. 4 and 1, 2 and 3, 3 and 2, 4 and 1 for five) and for doubles to 10 (3 and 3 for six). C. Use objects, pictures, numbers, or words to create, solve and explain story problems (combining, separating, or comparing) for two numbers that are each less than 10.	Know number names and count sequence. Count to tell the number of objects. Compare numbers.
First Grade	M1N1. Students will estimate, model, compare, order, and represent whole numbers up to 100. A. Represent numbers up to 100 using a variety of models, diagrams, and number sentences. Represent numbers larger than 10 in terms of tens and ones using manipulatives and pictures. B. Correctly count and represent the number of objects in a set using numerals. C. Compare small sets using the terms greater than, less than, and equal to. D. Understand the magnitude and order of numbers up to 100 by making ordered sequences and representing them on a number line. E. Exchange equivalent quantities of coins by making fair trades involving combinations of pennies, nickels, dimes and quarters up to one dollar; count out a combination of coins needed to purchase items up to one dollar. F. Identify bills ($1, $5, $10, $20) by name and value and exchange equivalent quantities by making fair trades involving combinations of bills; count out a combination of bills needed to purchase items that total up to twenty dollars. M1N2. Students will understand place value notation for the numbers 1 to 99. (Discussions may allude to 3-digit number to assist in understanding place value.) A. Determine to which ten a given number is closest using tools such as a sequential number line or chart. B. Represent collections of less than 30 objects with 2-digit numbers and understand the meaning	Represent and solve problems involving addition and subtraction. Add and subtract within 20. Understand and apply properties of operations and the relationship between addition and subtraction. Extend the counting sequence. Understand place value. Use place value understanding to add and subtract.

	Georgia Performance Standards, 2004	Common Core Math, 2013
First Grade Continued	of place value. C. Decompose numbers from 10 to 99 as the appropriate number of tens and ones. M1N3. Students will add and subtract numbers less than 100, as well as understand and use the inverse relationship between addition and subtraction. A. Identify one more than, one less than, 10 more than, and 10 less than a given number. B. Skip-count by 2s, 5s, and 10s, forward and backwards, to and from numbers up to 100. C. Compose and decompose numbers up to 10 (e. g. 3+5=8, 8=5+1+2). D. Understand a variety of situations to which subtraction may apply; taking away from a set, comparing two sets, and determining how many more or how many less. E. Understand addition and subtraction number combinations using strategies such as counting on, counting back, doubles and making tens. F. Know the single digit addition facts to 18 using corresponding subtraction facts with understanding and fluency. (Use strategies such as relating facts already known, applying the commutative property, and grouping facts into families.) G. Apply addition and subtraction to 2 digit numbers without regrouping (e.g. 15+4, 80-60, 56+10, 100-30, 52+5). H. Solve and create word problems involving addition and subtraction to 100 without regrouping. Use words, pictures and concrete models to interpret story problems and reflect the combining of sets as addition and taking away or comparing elements of sets as subtraction. M1N4. Students will count collections of up to 100 objects by dividing them into equal parts and represent the results using words, pictures, or diagrams. A. Use informal strategies to share objects equally between two to five people. B. Build number patterns, including concepts of even and odd, using various concrete representations. (Examples of concrete representations include a hundreds chart, ten grid frame, place value chart, number line, counters, or other objects.) C. Identify label and relate fractions (halves, fourths) as equal parts of a collection of objects or a whole using pictures or models. D. Understand halves and fourths as representations of equal parts of a whole.	
Second Grade	M2N1. Students will use multiple representations of numbers to connect symbols to quantities. A. Represent numbers using a variety of models, diagrams, and number sentences (e.g. 4703 represented as 4,000+700+3, and units, 47 hundreds+ 3, or 4,500+203). B. Understand the relative magnitudes of numbers using 10 as a unit, 100 as a unit, or 1000 as a unit. Represent 2-digit numbers with drawings of tens and ones and 3-digit numbers with drawings of hundreds, tens, and ones. C. Use money as a medium of exchange. Make change and use decimal notation and the dollar and cent symbols to represent the collection of coins and currency. M2N2. Students will build fluency with multi-digit addition and subtraction. A. Correctly add and subtract two whole numbers up to three digits each with regrouping. B. Understand and use the inverse relationship between addition and subtraction to solve problems and check solutions. C. Use mental math strategies such as benchmark numbers to solve problems.	Represent and solve problems involving addition and subtraction. Add and subtract within 20. Work with equal groups to gain foundations for multiplication. Understand place value. Use place value understanding and properties of operations to add and subtract.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Second Grade Continued	D. Use basic properties of addition (commutative, associative, and identity) to simplify problems (e.g. 98+17 by taking two from 17 and adding it to the 98 to make 100 and replacing the original problem by the sum of 100+15). E. Estimate to determine if solutions are reasonable for addition and subtraction. M2N3. Students will understand multiplication, multiply numbers, and verify results. A. Understand multiplication as repeated addition. B. Use repeated addition, arrays, and counting by multiples (skip counting) to correctly multiply 1-digit numbers and construct a multiplication table. C. Use the multiplication table (grid) to determine the product of two numbers. D. Use repeated subtraction, equal sharing, and forming equal groups to divide large collections of objects and determine factors for multiplication. M2N4. Students will understand and compare fractions. A. Model, identify, label, and compare fractions (thirds, sixths, eighths, tenths) as a representation of equal parts of a whole or of a set. B. Know that when all fractional parts are included, such as three thirds, the result is equal to the whole. M2N5. Students will represent and interpret quantities and relationships using mathematical expressions including equality and inequality signs. A. Include the use of boxes or _ to represent a missing value. B. Represent problem solving situations where addition, subtraction or multiplication may be applied using mathematical expressions.	
Third Grade	M3N1 Develop understanding of whole numbers and ways of representing them. A. Identify place values from tenths to ten thousands. Understand the relative sizes of digits in place value notation and ways to represent them. M3N3 Understanding of multiplication of whole numbers and develop the ability to apply it in problem solving. A. Describe the relationship between multiplication and division. B. Know the multiplication facts with understanding and fluency to 10 X10. C. Use arrays and area models to develop understanding of the distributive property and to determine partial products for multiplication of a 2 or 3 digit numbers by a 1 digit number. M3M4 Understand the meaning of division and develop the ability to apply it in problem solving. M3M5 Understand the meaning of decimal fractions and common fractions in simple cases and apply them in problem solving situations.	Represent and solve problems involving multiplication and division. Properties of multiplication and the relationship between X and division. Multiply and divide within 100. Solve problems involving the four operations. Use place value and properties of operations to perform multi-digit arithmetic. Develop understanding of fractions as numbers.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Fourth Grade	M4N1 Understanding of how whole numbers are represented in the base 10 numeration system. A. Identify place value names and places from the hundredths through one million. B. Equate a number's word name, its standard form, and its expanded form. M4N2 Understand and apply the concept of rounding numbers. A. Round to the nearest ten, hundred, or thousand. B. Describe situations in which rounding numbers would be appropriate and determine whether to round to the nearest ten, hundred or thousand. C. Determine to which whole number or tenth a given decimal is closest using tools such as a number line, and/or charts. D. Round a decimal to the nearest whole number or tenth. E. Represent the results of computation as a rounded number with appropriate and estimate a sum or difference by rounding numbers. M4N3 Solve problems involving multiplication of 2 and 3 digit numbers by 1 and 2 digit numbers. M4N4 Understand division of whole numbers and divide in problem solving situations without calculators. A. Know the division facts with understanding and fluency. B. Solve problems involving division by 1 or 2 digit numbers (including those that generate a remainder). C. Understand the relationship between the dividend, divisor, quotient, and remainder. D. Understand and explain the effect on the quotient of multiplying or dividing both the divisor and the dividend by the same number. (2050/50 = 205/5). M4N5 Further develop understanding of the meaning of decimals and use them in computations. A. Understand decimals are part of the base 10 system. B. Understand the relative size of numbers and order two digit decimals. C. Add and subtract both one and two digit decimals. D. Model multiplication and division of decimals by whole numbers. E. Multiply and divide both one and two digit decimals by whole numbers. M4N6 Understand the meaning of common fractions and use them in computations. A. Understand representations of simple equivalent fractions. B. Add and subtract fractions and mixed numbers with common denominators. C. Convert and use mixed numbers and improper fractions interchangeably. M4N7 Explain and use properties of the four arithmetic operations to solve and check problems. A. Describe situations in which the four operations may be used and relationships among them. B. Compute using the order of operations, including parentheses. C. Compute using the commutative, associative, and distributive properties. D. Use mental math and estimation strategies to compute.	Use place value for multi-digit arithmetic. Use the four operations with whole numbers to solve problems. Gain familiarity with factors and multiples. Fraction equivalence and ordering. Build fractions from unit fractions. Understand decimal notation for fractions and compare decimal fractions.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Fifth Grade	M5M1 Understand whole numbers. A. Classify the set of counting numbers into subsets with distinguishing characteristics (odd/even, prime/composite) B. Find multiples and factors. C. Analyze and use divisibility rules. M5N2 Understand decimals as part of the base-ten number system. A. Understand place value. B. Analyze the effect on the product when a number is multiplied by 10,100, 1000, 0.1, and 0.01. C. Use greater than, less than, or = to compare decimals and justify the comparison. M5N3 Understand the meaning of multiplication and division with decimal fractions and use them. A. Model multiplication and division of decimal fractions by another decimal fraction. B. Explain the process of multiplication, division, including situations in which the multiplier and divisor are both whole numbers and decimal fractions. C. Multiply and divide with decimal fractions including decimal fractions less than one and greater than one. D. Understand the relationships and rules for multiplication and division of whole numbers also apply to decimal fractions. M5N4 Understand meaning of common fractions and compute with them. A. Division of whole numbers can be represented by a fraction. B. Understand the value of a fraction is not changed when both its numerator and denominator are multiplied or divided by the same number because it is the same as multiplying or dividing by 1. C. Find equivalent fractions and simplify fractions. D. Model the multiplication and division of common fractions. E. Explore finding common denominators by using concrete, pictorial, and computational models. F. Use greater than, less than or = to compare fractions and justify the comparison. G. Add and subtract common fractions with mixed numbers and unlike denominators. H. Use fractions (proper and improper) and decimals interchangeably. I. Estimate products and quotients. M5N5. Students will understand the meaning of percentage. A. Explore and model percents using multiple representations. B. Apply percents to circle graphs.	Place Value Operations with multi digit numbers and with decimals to the hundredths. Use equivalent fractions as a strategy to add and subtract fractions. Multiply and divide fractions. Division of a fraction by a fraction is not required at this grade.
Sixth Grade	M6N1. Students will understand the meaning of the four arithmetic operations as related to positive rational numbers and will use these concepts to solve problems. A. Apply factors and multiples. B. Decompose numbers into their prime factorization (Fundamental Theorem of Arithmetic). C. Determine the greatest common factor (GCF) and the least common multiple (LCM) for a set of numbers. D. Add and subtract fractions and mixed numbers with unlike denominators. E. Multiply and divide fractions and mixed numbers. F. Use fractions, decimals, and percents interchangeably. G. Solve problems involving fractions, decimals and percents.	Divide fractions by fractions. Compute fluently with multi-digit numbers and find common factors and multiples. Understand rational numbers. Understand ratio and use ratio reasoning to solve problems.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Seventh Grade	M7N1. Students will understand the meaning of positive and negative rational numbers and use them in computation. A. Find the absolute value of a number and understand it as the distance from zero on a number line. B. Compare and order rational numbers, including repeating decimals. C. Add, subtract, multiply and divide positive and negative rational numbers. D. Solve problems using rational numbers.	Analyze proportional relationships and use them to solve real-world and mathematical problems. Use fractions to add, subtract, multiply and divide rational numbers.
Eighth Grade	M8N1. Students will understand different representations of numbers including square roots, exponents, and scientific notation. A. Find square roots of perfect squares. B. Recognize the (positive) square root of a number as a length of a side of a square with a given area. C. Recognize square roots as points and as lengths on a number line. D. Understand that the square root of 0 is 0 and that every positive number has two square roots that are opposite in sign. Recognize and use the radical sign to denote the positive square root of a positive number.	Know that there are numbers that are not rational, and approximate them by rational numbers.

A Comparison of Math Standards: Algebra

	Georgia Performance Standards, 2004	Common Core Math, 2013
Pre-K to Kindergarten	MKN2. Students will use representations to model addition and subtraction. A. Use counting strategies to find out how many items are in two sets when they are combined, separated, or compared. B. Build number combinations up to 10. C. Use objects, pictures, numbers, or words to create, solve and explain story problems (combining, separating, or comparing) for two numbers that are each less than 10.	Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
First Grade	M1N4. B. Build number patterns, including concepts of even and odd, using various concrete representations.	Represent and solve problems involving addition and subtraction. Work with addition and subtraction equations.
Second Grade	M2N1. Students will use multiple representations of numbers to connect symbols to quantities. A. Represent numbers using a variety of models, diagrams, and number sentences (e.g. 4703 represented as 4,000+700+3, and units, 47 hundreds+ 3, or 4,500+203). M2N2. B. Understand and use the inverse relationship between addition and subtraction to solve problems and check solutions. D. Use basic properties of addition (commutative, associative, and identity) to simplify problems (e.g. 98+17 by taking two from 17 and adding it to the 98 to make 100 and replacing the original problem by the sum of 100+15). M2N5. Students will represent and interpret quantities and relationships using mathematical expressions including equality and inequality signs. A. Include the use of boxes or _ to represent a missing value. B. Represent problem solving situations where addition, subtraction or multiplication may be applied using mathematical expressions.	Represent and solve problems involving addition and subtraction.
Third Grade	M3A1 Use mathematical expressions to represent relationships between quantities and interpret given expressions. A. Describe and extend numeric and geometric patterns. B. Describe and explain a quantitative relationship represented by a formula (such as the perimeter of a geometric figure) C. Use a symbol to represent an unknown and find the value of the unknown in a number sentence.	Represent and solve problems involving multiplication and division. Identify and explain patterns in arithmetic

	Georgia Performance Standards, 2004	Common Core Math, 2013
Fourth Grade	M4A1 Represent and interpret mathematical relationships in quantitative expressions. A. Understand and apply patterns and rules to describe relationships and solve problems. B. Represent unknowns using symbols. C. Write and evaluate mathematical expressions using symbols and different values. M4N4 Understand division of whole numbers and divide in problem solving situations without calculators. D. Understand and explain the effect on the quotient of multiplying or dividing both the divisor and the dividend by the same number. (2050/50 = 205/5).	Generate and analyze patterns.
Fifth Grade	5MA1 Represent and interpret relationships between quantities algebraically. A. Use variables such as n or x for unknown quantities in algebraic expressions. B. Investigate simple algebraic expressions by substituting numbers for the unknown. C. Determine that a formula will be reliable regardless of the type of number (whole numbers or decimals) substituted for the variable.	Analyze patterns and relationships. Write and interpret numerical expressions.
Sixth Grade	M6A1. Students will understand the concept of ratio and use it to represent quantitative relationships. M6A2. Students will consider relationships between varying quantities. A. Analyze and describe patterns arising from mathematical rules, tables, and graphs. B. Use manipulatives or draw pictures to solve problems involving proportional relationships. C. Use proportions (a/b=c/d) to describe relationships and solve problems, including percent problems. D. Describe the proportional relationships mathematically using y=kx where k is the constant of proportionality. E. Graph proportional relationships in the form y=kx and describe the characteristics of the graphs. F. In a proportional relationship expressed as y=kx, solve for one quantity given values of the other two. Given quantities may be whole numbers, decimals, or fractions. Solve problems using the relationship y=kx. G. Use proportional reasoning (a/b=c/d and y=kx to solve problems. M6A3. Students will evaluate algebraic expressions, including those with exponents, and solve simple one-step equations using each of the four basic operations.	Apply arithmetic to algebraic expressions. Reason about and solve one-variable equations and inequalities. Represent and analyze quantitative relationships between dependent and independent variables.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Seventh Grade	M7A1. Students will represent and evaluate quantities using algebraic expressions. A. Translate verbal phrases into algebraic expressions. B. Simplify and evaluate algebraic expressions, using commutative, associative, and distributive properties as appropriate. C. Add and subtract linear expressions. M7A2. Students will understand and apply linear equations in one variable. A. Given a problem, define the variable, write an equation, solve the equation, and interpret the solution. B. Use the addition and multiplication properties of equality to solve one-and two-step linear equations. M7A3. Students will understand the relationship between two variables. A. Plot points on a coordinate plane. B. Represent, describe, and analyze relations from tables, graphs, and formulas. C. Describe how change in one variable effects the other variable. D. Describe patterns in the graphs of proportional relationships, both direct (y=kx) and inverse (y=k/x).	Use properties of operations to generate equivalent expressions. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Eighth Grade	M8A1. Students will use algebra to represent, analyze, and solve problems. A. Represent a given situation using algebraic expressions or equations in one variable. B. Simplify and evaluate algebraic expressions. C. Solve algebraic equations in one variable, including expressions involving absolute values. D. Solve equations involving several variables for one variable in terms of the others. E. Interpret solutions in problems contexts. M8A2. Students will understand and graph inequalities in one variable. A. Represent a given solution using an inequality in one variable. B. Use properties of inequality to solve inequalities. C. Graph the solution of an inequality on a number line. D. Interpret solutions in problem contexts. M8A3. Students will understand relations and linear functions. A. Recognize a relation as a correspondence between varying quantities. B. Recognize a function as a correspondence between inputs and outputs where the output for each input must be unique. C. Distinguish between relations that are functions and those that are not functions. D. Recognize functions in a variety of representations and a variety of contexts. E. Use tables to describe sequences recursively and with a formula in closed form. F. Understand and recognize arithmetic sequences as linear functions with whole number input values. G. Interpret the constant difference in an arithmetic sequence as the slope of the associated linear function. H. Identify relations and functions as linear or nonlinear. I. Translate among verbal, tabular, and algebraic representations of functions. M8A4. Students will graph and analyze graphs of linear equations and inequalities. A. Interpret slope and a rate of change. B. Determine the meaning of the slope and y-intercept in a given situation. C. Graph equations in the form of y=mx+b. D. Graph equations in the form ax+by=c. E. Graph the solution set of a linear inequality, identifying whether the solution set is an open or closed half-plane. F. Determine the equation of a line given a graph, numerical information that defines the line or a context involving a linear relationship. G. Solve problems involving linear relationships. M8A5. Students will understand systems of linear equations and inequalities and use them to solve problems. A. Given a problem context, write an appropriate system of linear equations or inequalities. B. Solve systems of equations graphically and algebraically, using technology as appropriate. C. Graph the solution set of a system of linear inequalities in two variables. D. Interpret solutions in problem contexts.	Work with radical and integer exponents. Understand the connections between proportional relationships, lines, and linear equations. Analyze and solve linear equations and pairs of simultaneous linear equations. Define, evaluate and compare functions. Use functions to model relationships between quantities.

A Comparison of Math Standards: Data Analysis and Probability

	Georgia Performance Standards, 2004	Common Core Math, 2013
Pre-K to Kindergarten	MKD1. Students will pose information questions, collect data, organize, and display results using objects, pictures, and picture graphs.	Classify objects and count the number of objects in categories.
First Grade	M1D1. Students will create simple tables and graphs and interpret them. A. Interpret tally marks, picture graphs, and bar graphs. B. Pose questions, collect, sort, organize and record data using objects, pictures, tally marks, picture graphs, and bar graphs.	Represent and interpret data.
Second Grade	M2D1. Students will create simple tables and graphs and interpret their meaning. A. Create, organize and display data using pictographs, Venn diagrams, bar graphs, picture graphs, simple charts, and tables to record results with scales of 1,2 and 5. B. Know how to interpret picture graphs, Venn diagrams, and bar graphs.	Represent and interpret data.
Third Grade	M3D1 Create and interpret simple tables and graphs. A. Solve problems by organizing and displaying data in bar graphs and tables. B. Construct and interpret bar graphs using scale increments of 1, 2, 5, and 10. C. Develop and evaluate mathematical arguments and proofs. D. Select and use various types of reasoning as methods of proof.	Represent and interpret data.
Fourth Grade	M4D1 Gather, organize, and display data according to the situation and compare related features. A. Represent data in bar, line, and pictographs. B. Investigate the features and tendencies of graphs. C. Compare various graphical representations for a given set of data. D. Identify missing information and duplications in data. E. Determine and justify the range, mode, and median of a set of data.	Represent and interpret data.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Fifth Grade	M5D1 Analyze graphs. A. Analyze data presented in a graph. B. Compare and contrast multiple graphic representations (circle graphs, line graphs, line plot graphs, pictographs, Venn diagrams, and bar graphs) for a single set of data and discuss the advantages and disadvantages of each. C. Determine and justify the mean, range, mode, and median of a set of data. M5D2 Collect, organize, and display data using the most appropriate graph.	Represent and interpret data.
Sixth Grade	M6D1. Students will pose questions, collect data, represent and analyze data, and interpret results. A. Formulate questions that can be answered by data. Students should collect data by using samples from larger populations (surveys), or by conducting experiments. B. Using data, construct frequency distributions, frequency tables, and graphs. C. Choose appropriate graphs to be consistent with the nature of the data (categorical or numerical). Graphs should include pictographs, histograms, bar graphs, line graphs, circle graphs, and line plots. D. Use tables and graphs to examine variation that occurs within a group and variation that occurs between groups. E. Relate the data analysis to the context of the questions posed. M6D2. Students will use experimental and simple probability and understand the nature of sampling. They will also make predictions from investigations. A. Predict the probability of a given even through trials/simulations (experimental probability), and represent the probability as a ratio. B. Determine, and use a ratio to represent, the theoretical probability of a given event. C. Discover that experimental probability approaches theoretical probability when the number of trials is large.	Develop understanding of statistical variability. Summarize and describe distributions.
Seventh Grade	M7D1. Students will pose questions, collect data, represent and analyze the data, and interpret results. A. Formulate questions and collect data from a census of at least 30 objects and from samples of various sizes. B. Construct frequency distributions. C. Analyze data using measures of central tendency (range, median, mode), including recognition of outliers. D. Analyze data with respect to variation (range, quartiles, interquartile range).	Use random sampling to draw inferences about a population. Draw informal comparative inferences about two populations. Investigate chance processes and develop, use and evaluate probability models.

Georgia Performance Standards, 2004		Common Core Math, 2013
Eighth Grade	M8D1. Students will apply basic concepts of set theory. A. Demonstrate relationships among sets through use of Venn diagrams. B. Determine subsets, complements, intersection, and union of sets. C. Use set notation to denote elements of a set. M8D2. Students will determine the number of outcomes related to a given event. A. Use tree diagrams to find the number of outcomes. B. Apply the addition and multiplication principles of counting. M8D3. Students will use the basic laws of probability. A. Find the probability of simple independent events. B. Find the probability of compound events. M8D4. Students will organize, interpret, and make inferences from statistical data. A. Gather data that can be modeled with a linear function. B. Estimate and determine a line of best fit from a scatter plot.	Investigate patterns and association in bivariate data.

A Comparison of Math Standards: Geometry

	Georgia Performance Standards, 2004	Common Core Math, 2013
Pre-K to Kindergarten	MKG1. Students will correctly name simple two and three dimensional figures, and recognize them in the environment. A. Recognize and name the following basic two-dimensional figures: triangles, quadrilaterals (rectangles, squares) and circles. B. Recognize and name the following three-dimensional figures: spheres and cubes. C. Observe concrete objects in the environment and represent the objects using basic shapes. D. Combine basic figures to form other basic and complex figures into basic figures; decompose basic and complex figures into basic figures. E. Compare geometric shapes and identify similarities and differences of the following two and three-dimensional shapes: triangles, rectangles, squares, circles, spheres, and cubes. MKG2. Students will understand basic spatial relationships. A. Identify when an object is beside another object, above another object, or below another object. B. Identify when an object is in front of another object, behind another object, inside another object, or outside it. MKG3. Students will identify, create, extend, and transfer patterns from one representation to another using actions, objects, and geometric shapes. A. Identify missing elements within a given pattern. B. Extend a given pattern and recognize similarities in different patterns. C. Create a pattern in a different context with attributes similar to a given pattern.	Identify and describe shapes. Analyze, compare, create, and compose shapes.
First Grade	M1G1. Students will study and create various two and three dimensional figures and identify basic figures (squares, circles, triangles, and rectangles) within them. A. Build, draw, name and describe triangles, rectangles, pentagons, and hexagons. B. Build, represent, name, and describe cylinders, cones, and rectangular prisms. C. Create pictures and designs using shapes, including overlapping shapes. M1G2. Students will compare, contrast, and/or classify geometric shapes by the common attributes of position, shape, size, number of sides, and number or corners. M1G3. Students will arrange and describe objects in space by proximity, position, and direction (near, far, below, above, up, down, behind, in front of, next to, and left or right of).	Reason with shapes and their attributes.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Second Grade	M2G1. Students will describe and classify plane figures (triangles, square, rectangle, trapezoid, quadrilateral, pentagon, hexagon, irregular polygonal shapes) according to the number of sides and vertices and the sizes of the angles. (right angle, obtuse, acute). M2G2. Students will describe and classify solid geometric figures (prisms, pyramids, cylinders, cones and spheres) according to such things as the number of edges and vertices and the number of shape faces and angles. A. Recognize the (plane) shapes of the faces of a geometric solid and count the number of faces of each type. B. Recognize the shape of an angle as a right angle, an obtuse, or an acute angle. M2G3. Students will describe the change in attributes as two and three dimensional shapes are cut and rearranged.	Represent and interpret data. Reason with shapes and their attributes.
Third Grade	M3G1 Students will further develop their understanding of geometric figures by drawing them. They will also state and explain their properties. A. Draw and classify fundamental geometric figures including scalene, isosceles and equilateral triangles. B. Identify and compare the properties of fundamental geometric figures. C. Examine and compare angles of fundamental geometric figures. D. Identify the center, diameter, and radius of a circle. M3M3 Understand and measure the perimeter of simple geometric figures. A. Understand the meaning of the linear unit and measurement in perimeter. B. Understand the concept of perimeter as being the length of the boundary of a geometric figure. M3M4 Understand and measure the area of simple geometric figures (squares and rectangles). A. Understand the meaning of the square unit and measurement in area. B. Model (by tiling) the area of a simple geometric figure using square units (square inch, square foot, etc.). C. Determine the area of squares and rectangles by counting, addition, and multiplication with models.	Reason with shapes and their attributes. Recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Fourth Grade	M4G1 Define and identify the characteristics of geometric figures through examination and construction. A. Examine and compare angles in order to classify and identify triangles by their angles. B. Describe parallel and perpendicular lines in plane geometric figures. C. Examine and classify quadrilaterals (including parallelograms, squares, rectangles, trapezoids, and rhombi.) D. Compare and contrast the relationships among quadrilaterals. M4G2 Understand fundamental solid figures. A. Compare and contrast a cube and rectangle prism in terms of the number and shape of their faces, edges, and vertices. B. Describe parallel and perpendicular lines and planes in conjunction with the rectangular prism. C. Construct/ collect models for solid geometric figures (cube, prism, cylinder, etc.) M4G3 Use the coordinate system. A. Understand and apply ordered pairs in the first quadrant of the coordinate system. B. Locate a point in the first quadrant in the coordinate plane and name an ordered pair. C. Graph ordered pairs in the first quadrant.	Draw and identify lines and angles, and classify shapes by properties of their lines and angles. Understand concepts of angle and measure angles.
Fifth Grade	M5G1 Understand congruence of geometric figures and the correspondence of their vertices, sides and angles. M5G2 Understand the relationship of the circumference of a circle, its diameter, and Pi = approximately 3.14. Related Measurement standards: M5M1 Understand area of fundamental geometric plane figures. A. Estimate the area of fundamental geometric plane figures. B. Derive the formula for the area of a parallelogram. C. Derive the formula for the area of a triangle. D. Find the areas of triangles and parallelograms using formulae. Estimate the area of a circle through partitioning and tiling and then find the area of a circle with formula. Discuss square units as they apply to circles. F. Find the area of a polygon (regular and irregular) by dividing it into squares, rectangles, and/or triangles and finding the sum of the areas of those shapes. G. Derive the formula for the area of a circle. H. Find the area of a circle using the formula and pi, approx. 3.14. M5M2. Students will extend their understanding of perimeter to include the circumference. A. Derive the formula for the circumference of a circle. B. Find the circumference of a circle using the formula and pi, approx. 3.14. M5M3 Measure capacity with appropriately chosen units and tools. A . Use millimeters, liters, fluid ounces, cups, pints, quarts, and gallons to measure capacity. M5M4 Understand and compute the volume of a simple geometric solid. A. Understand a cubic unit is represented by a cube in which each edge has the length of 1 unit. C. Derive the formula for finding the volume of a cube and a rectangular prism using manipulatives. D. Compute the volume of a cube and a rectangular prism using formulae. E. Estimate the volume of a simple geometric solid. F. Understand the similarities and differences between volume and capacity.	Graph points on the coordinate plane to solve real-world problems. Classify two-dimensional figures based on their properties.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Sixth Grade	M6G1. Students will further develop their understanding of plane figures. A. Determine and use lines of symmetry. B. Investigate rotational symmetry, including degree of rotation. C. Use concepts of ratio, proportion, and scale factor to demonstrate the relationships between similar plane figures. D. Interpret and sketch simple scale drawings. E. Solve problems involving scale drawings. M6G2. Students will further develop their understanding of solid figures. A. Compare and contrast right prisms and pyramids. B. Compare and contrast cylinders and cones. C. Interpret and sketch front, back, top, bottom and side views of solid figures. D. Construct nets for prisms, cylinders, pyramids, and cones.	Solve real world and mathematical problems involving area, surface area, and volume.
Seventh Grade	M7G1. Students will construct plane figures that meet given conditions. A. Perform basic constructions using both a compass and straight edge, and appropriate technology. Constructions should include copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line. B. Recognize that many constructions are based on the creation of congruent triangles. M7G2. Students will demonstrate understanding of transformations. A. Demonstrate understanding of translations, dilations, rotations, reflections, and relate symmetry to appropriate transformations. B. Given a figure in the coordinate plane, determine coordinates resulting from a translation, dilation, rotation, or reflection. M7G3. Students will use the properties of similarity and apply these concepts to geometric figures. A. Understand the meaning of similarity, visually compare geometric figures for similarity, and describe similarities by listing corresponding parts. B. Understand the relationships among scale factors, length ratios, and area ratios between similar figures. Use scale factors, length ratios, and area ratios to determine side lengths and areas of similar geometric figures. C. Understand the congruence of geometric figures as a special case of similarity: The figures have the same size and same shape. M7G4. Students will further develop their understanding of three-dimensional figures. A. Describe three dimensional figures formed by translations and rotations of plane figures through space. B. Sketch, model, and describe cross-sections of cones, cylinders, pyramids, and prisms.	Draw, construct and describe geometrical figures and describe the relationships between them. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Eighth Grade	M8G1. Students will understand and apply the properties of parallel and perpendicular lines and understand the meaning of congruence. A. Investigate characteristics of parallel and perpendicular lines both algebraically and geometrically. B. Apply properties of angle pairs formed by parallel lines cut by a transversal. C. Understand the properties of the ratio of segments of parallel lines but by one or more transversals. D. Understand the meaning of congruence: that all corresponding angles are congruent and all corresponding sides are congruent. M8G2. Students will understand and use the Pythagorean theorem. A. Apply properties of right triangles, including the Pythagorean theorem. B. Recognize and interpret the Pythagorean theorem as a statement about areas of squares on the sides of a right triangle.	Understand congruence and similarity using physical models, transparencies, or geometry software. Understand and apply the Pythagorean theorem. Solve real world and mathematical problems involving volume of cylinders, cones, and spheres.

A Comparison of Math Standards: Data Analysis and Probability

	Georgia Performance Standards, 2004	Common Core Math, 2013
Pre-K to Kindergarten	MKM1. Students will group objects according to common properties such as longer/shorter, more/less, taller/shorter, and heavier/lighter. A. Compare and order objects on the basis of length. B. Compare and order objects on the basis of capacity. C. Compare and order objects on the basis of height. D. Compare and order objects on the basis of weight. MKM2. Students will understand the measurement of calendar time. A. Know the names of the days of the week, as well as understand yesterday, today and tomorrow. B. Know the months of the year. C. Know the four seasons. MKM3. Students will understand time as it relates to a daily schedule. A. Order daily events. B. Tell the time when daily events occur, such as morning, afternoon, and evening. C. Know the name of the day of the week when weekly events occur in class.	Describe and compare measurable objects.
First Grade	M1M1. Students will compare and/or order length, height, weight, or capacity of two or more objects by using direct comparison or a nonstandard unit. A. Directly compare and/or order length, height, weight, and capacity of concrete objects. B. Estimate and measure using a non-standard unit that is smaller than the object to be measured. C. Measure with a tool by creating a "ruled" stick tape, or container by marking off ten segments of the repeated single unit. M1M2. Students will develop an understanding of the measurement of time. A. Tell time to the nearest hour and half hour and understand the movement of the minute hand and how it relates to the hour hand. B. Begin to understand the relationship of calendar time by knowing the number of days in a week and months in a year. C. Compare and/or order the sequence or duration of events (e.g. shorter/longer and before/after).	Measure lengths indirectly by iterating length units. Tell and write time.
Second Grade	M2M1. Students will know the standard units of inch, foot, yard, and metric units on centimeter and meter and measure length to the nearest inch or centimeter. A. Compare the relationship of one unit to another by measuring objects twice using different units each time. B. Estimate lengths, and then measure to determine if estimations were reasonable. C. Determine an appropriate tool and unit for measuring. M2M2. Students will tell time to the nearest five minutes and know relationships of time such as the number of seconds in a minute, minutes in an hour and hours in a day. M2M3. Students will explore temperature. A. Determine a reasonable temperature for a given situation. B. Read a thermometer.	Measure and estimate lengths in standard units. Relate addition and subtraction to length. Work with time and money.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Third Grade	M3M1 Develop further understanding of the concept of time determining elapsed time of a full, half, and quarter hour. M3M2. Students will measure length choosing appropriate units and tools. A. Use the units kilometer (km) and mile (mi.) to discuss the measure of long distances. B. Measure to the nearest 1/4 inch, 1/2 inch and millimeter (mm) in addition to the previously learned inch, foot, yard, centimeter, and meter. C. Estimate length to represent it using appropriate units. D. Compare one unit to another within a single system of measurement. M3M3 Understand and measure the perimeter of simple geometric figures. M3M4 Understand and measure the area of simple geometric figures. A. Understand the meaning of the linear unit and measurement in perimeter. B. Understand the concept of perimeter as being the length of the boundary of a geometric figure. C. Determine the perimeter of a geometric figure by measuring and summing the lengths of the sides. M3M4 Students will understand and measure the area of simple geometric figures (squares and rectangles). A. Understand the meaning of the square unit and measurement in area. B. Model (by tiling) the area of a simple geometric figure using square units (square inch, square foot, etc.) C. Determine the area of squares and rectangles by counting, addition, and multiplication with models.	Solve problems with time, liquid volumes, and mass. Relate area to multiplication and addition.
Fourth Grade	M4M1 Understand the concept of weight and how to measure it. A. Use standard and metric units to measure the weight of objects. B. Know units used to measure weight (gram, kilogram, ounces, pounds, and tons.) C. Compare one unit to another within a single system of measurement. M4M2 Understand the concept of angles and how to measure it. A. Use tools such as a protractor or angle ruler and other methods such as paper folding, drawing a diagonal in a square, to measure angles. B. Understand the meaning and measure of a half rotation (180 degrees) and a full rotation (360 degrees). C. Determine that the sum of the three angles of a triangle is always 180 degrees.	Convert measurements from a larger unit to a smaller unit. Solve problems involving measurement.
Fifth Grade	M5M1 Understand area of fundamental geometric plane figures. A. Estimate the area of fundamental geometric plane figures. B. Derive the formula for the area of a parallelogram. C. Derive the formula for the area of a triangle. D. Find the areas of triangles and parallelograms using formulae. Estimate the area of a circle through partitioning and tiling and then find the area of a circle with formula. Discuss square units as they apply to circles. F. Find the area of a polygon (regular and irregular) by dividing it into squares, rectangles, and/or triangles and finding the sum of the areas of those shapes. G. Derive the formula for the area of a circle. H. Find the area of a circle using the formula and pi, approx. 3.14. M5M2. Students will extend their understanding of perimeter to include the circumference. A. Derive the formula for the circumference of a circle. B. Find the circumference of a circle using the	Convert like measurements within a given measurement system. Relate concepts of volume to multiplication and addition.

	Georgia Performance Standards, 2004	Common Core Math, 2013
Fifth Grade Continued	formula and pi, approx. 3.14. M5M3 Measure capacity with appropriately chosen units and tools. A. Use millimeters, liters, fluid ounces, cups, pints, quarts, and gallons to measure capacity. B. Compare a unit with another within a single system of measurement (e.g. 1 quart=2 pints) M5M4 Understand and compute the volume of a simple geometric solid. A. Understand a cubic unit is represented by a cube in which each edge has the length of 1 unit. B. Identify the units used in computing volume as cubic centimeters, cubic meters, cubic inches, cubic feet, and cubic yards. C. Derive the formula for finding the volume of a cube and a rectangular prism using manipulatives. D. Compute the volume of a cube and a rectangular prism using formulae. E. Estimate the volume of a simple geometric solid. F. Understand the similarities and differences between volume and capacity.	
Sixth Grade	M6N1. Students will convert from one unit to another within one system of measurement (customary or metric) by using proportional relationships. M6N2. Students will use appropriate units of measure for finding length, perimeter, area and volume and will express each quantity using the appropriate unit. A. Measure length to the nearest half, fourth, eighth and sixteenth of an inch. B. Select and use units of appropriate size and type to measure length, perimeter, area, and volume. C. Compare and contrast units of measure for perimeter, area and volume. M6M3. Students will determine the volume of fundamental solid figures (right rectangular prisms, cylinder, pyramids and cones). A. Determine the formula for finding the volume of fundamental solid figures. B. Compute the volumes of fundamental solid figures, using appropriate units of measure. C. Estimate the volumes of simple geometric solids. D. Solve application problems involving the volume of fundamental solid figures. M6M4. Students will determine the surface area of solid figures (right rectangular prisms and cylinders). A. Find the surface area of right rectangular prisms and cylinders using manipulatives and constructing nets. B. Compute the surface area of right rectangular prisms and cylinders using formulae. C. Estimate the surface areas of simple geometric solids. D. Solve application problems involving surface area of right rectangular prisms and cylinders.	No measurement concepts in 6th grade.

Georgia Performance Standards, 2004		Common Core Math, 2013
Seventh Grade		No measurement concepts in 7th grade.
Eighth Grade		No measurement concepts in 7th grade.

Mary Kay Bacallao, Ed.D.

WORK HISTORY

2008-present — *Professor of Education, Tift College of Education, Mercer University*
Courses Taught:
EDUC 210 Instructional Technology
EDUC 211 The Construction of Scientific and Mathematical Thinking
EDUC 646 ESOL Methods and Materials
EDUC 601 Problem Solving
EDUC 220 Foundations of Education
EDUC 722 Leadership in Professional Development
EDCI 845 Curricular and Instructional Technology
EDMT 677 Number Sense and Algebra in Early Childhood Education
EDMT 678 Geometry
EDMT 679 Mathematics Content Pedagogy

2003-2008 — *Associate Professor of Education, Tift College of Education, Mercer University*
Earned Tenure at Mercer University in the spring of 2006
Courses Taught:
EDUC 211The Construction of Scientific and Mathematical Thinking
EDUC 421 Science Methods for Early Childhood Education
EDUC 422 Science Methods for Middle Grades Education
EDUC 210 Educational Technology
EDUC 454 Math Methods for Early Childhood Education
EDUC 455 Math Methods for Middle Grades Education
EDUC 401 Early Childhood Curriculum
Practicum and Student Teaching University Supervisor

2006-2010 — *National Urban Alliance Consultant/Mentor*
Albany, New York, Birmingham, Alabama and Newark, New Jersey, www.nuatc.org

March 2003 — *Promoted to Associate Professor of Education at St. Thomas University*
Earned Tenure at St. Thomas University in the spring of 2003

1999-2003 — *25% Assistant Professor of Math, Science, and Elementary Education, Teacher Education Department, St. Thomas University*
75% Project Director: Preparing Tomorrow's Teachers to Use Technology
FY 2000 – FY 2002 Implementation Grant from the U.S. Department of Education
The project was funded for $1,232,199.00.
FY 1999 Capacity Building Grant from the U. S. Department of Education
The project was funded for $143,400.00
Courses taught:
EDU 303 Mathematics/Content Area Instruction in the Elementary Multicultural School Setting
EDU 304 Science/Content Area Instruction in the Elementary Multicultural School Setting
EDU 450 Curriculum Technology
EDU 300 General Methods of Teaching

1998-1999 — *Assistant Professor, Teacher Education Department, St. Thomas University*
Courses taught:
EDU 300 General Methods of Teaching
EDU 303 Mathematics/Content Area Instruction in the Elementary Multicultural School Setting
EDU 304 Science/Content Area Instruction in the Elementary Multicultural School Setting
EDU 450 Curriculum

Supervisor of Teacher Interns

1997-1998 *Visiting Assistant Professor of Science and Math, Florida Atlantic University*
Courses taught:
SCE 4350 Science in the Elementary and Middle School
MAE 4350 Mathematics in the Elementary and Middle School

1995-1997 *Fourth Grade Teacher, Welleby Elementary, Broward County Schools*
Technology Team, IDEAS project Science Mentor teacher, Florida Atlantic University

1996-1997 *Adjunct Instructor, MAE 4350 Math Methods in the Elementary and Middle School*
Florida Atlantic University

1994-1995 *Second Grade Teacher, Miramar Elementary, Broward County Schools*
IDEAS project Science Mentor teacher, Florida Atlantic University

1992-1994 *Fourth/Fifth Grade Teacher, Welleby Elementary, Broward County Schools*
Technology Team, Supervisor of Student Teaching, Grade Chairperson

1990-1992 *Third/Second Grade Teacher, Banyan Elementary, Broward County Schools*

1988-1990 *Fifth/Third Grade Teacher, North County Elementary, Miami-Dade County Public Schools*
Elected to the School Based Management Shared Decision Making Cadre

EDUCATION

2004-2010 Additional Graduate Courses at Mercer University GPA 4.0
- EMAT 672 Teaching Science for Middle Grades and Secondary
- EDMT 631 Geometry for the Middle Grades and High School
- EDMT 611 The Theory of Arithmetic
- EDUC 666 Advanced Teaching of Mathematics in the Middle and High School
- EDUC 699 Teaching Calculus
- EDMT 621 Algebra for Middle Grades/Secondary Teaching
- EDMT 678 Geometry, Measurement and Data Analysis in ECE
- EDUC 583 Introduction to Special Education

2001-2002 Additional Undergraduate and Graduate Courses Completed for Science Certification at FAU, St. Thomas University and BCC: Physics, Methods of Teaching Middle and Secondary School Science, Bioregions, Marine Biology, Ecology, Science Research and Crime Analysis, GPA 4.0

1994-1996 Doctor of Education, Educational Leadership, Florida Atlantic University, GPA 4.0

1991-1994 Specialist in Educational Leadership, Florida Atlantic University, GPA 4.0

1989-1991 Master of Science in Education, Florida Atlantic University, GPA 4.0

1986-1988 Bachelor of Arts in Elementary Education and Bible, Miami Christian College/Trinity International University, GPA 4.0

1982-1986 High School Diploma, Madonna Academy, Hollywood, Florida GPA 4.0+

STATE OF GEORGIA CERTIFICATION

Mathematics K-12
Science K-12
Educational Leadership K-12
Early Childhood P-5
Middle Grades Science
Middle Grades Math
Math Grades 6-12
Science Grades 6-12
English as a Second Language

MANUSCRIPT REVIEWS

Integrating Technology into the PK-2 Classroom, published by "ISTE" the International Society for Technology in Education, invited review, July 2002.

INVITED PRESENTATIONS

Bacallao, Mary Kay, *New Ways for Teaching and Learning Key Math Concepts*, ATMNE (Association of Teachers of Mathematics in New England) Annual Meeting, Enlighten Yourself!, Warwick, Rhode Island, November 9, 2011.

Bacallao, Mary Kay, Presentation at the Metro Mathematics Supervisors Meeting,
Topics: Liquid Measure Fractions, Equals, Quadrilateral Pieces, Rainbow Number Puzzles, STAR 10, McDonough, Georgia, December 13, 2010.

National Urban Alliance
Albany City Schools – Teaching Strategies for Culture, Language and Cognition
October 18, 2006 and November 9, 2006.

National Urban Alliance
Newark City Schools – Miller Street Academy- Science and Math Teaching Strategies
October 26 and 27th, 2006, November 16th and 17th, 2006, December 13th and 14th, 2006, January 3rd and 4th, April 17th, 18th, and 19th, May 3rd and 4th, 2007.

Eastside Christian School
K-8 Teaching Strategies for Mathematical Problem Solving Workshop and Demonstration Lessons in the 3rd and 7th grade classrooms, September 26th and 27th, 2006.

Bacallao, Mary Kay, and Lacefield, William Otis, *Excel Templates for the NCTM Standards*, 2004 Fall Forum, Leap into Mathematics, Alabama Council of Teachers of Mathematics, Montgomery, Alabama, October 22, 2004.

REVIEW COMMITTEES

Georgia Professional Services Commission
Content Review Panel Member
Agnes Scott MAT, Physics, January, 2006
Agnes Scott MAT, Chemistry, January, 2006

Georgia Professional Services Commission
Content Review Panel Member
La Grange College Middle Grades Program Reviewer, August, 2005

Journal of Computers in Mathematics and Science Teaching, editorial board member and reviewer, 2004-2005

Society for Information Technology and Teacher Education, Invited Member of the 2006 Program Review Committee, Orlando, Florida, March, 2006

Society for Information Technology and Teacher Education, Invited Member of the 2005 Program Review Committee, Phoenix, Arizona, March, 2005

Society for Information Technology and Teacher Education, Invited Member of the 2004 Program Review Committee, Atlanta, Georgia, 2004

RESEARCH PROPOSALS

Bacallao, Mary Kay, Jones, Margie, and Whatley, Clemmie. Innovative Strategies for Students with Math Related Learning Disabilities. Authored a grant application in collaboration with Henry and Clayton Counties for the Special Education Research Grant (CFDA Number: 84.324A), sponsored by the Institute of Education Sciences and the U.S. Department of Education. June, 2010, not funded.

Bacallao, Mary Kay, Bridging the Digital Divide in South Florida, Preparing Tomorrow's Teachers to Use Technology, U.S. Department of Education Grant., 2000, funded for **$1,232,199.00**.

Bacallao, Mary Kay, Bringing Technology to the Inner City, Preparing Tomorrow's Teachers to Use Technology, U. S. Department of Education Grant, 1999, funded for **$143,400.00**.

PUBLICATIONS

Gallenstein, Nancy and Hodges, Dodi, Editors, Whatley, Clemmie and Bacallao, Mary Kay, contributing authors of a chapter in Mathematics for All: Instructional Strategies to Assist Students with Learning Challenges. Association for Childhood Education International, January 5, 2011.

Bacallao, Mary Kay, Equals: The Game of Strategy for the Basic Facts: patent granted by the United States Patent Office, July 2010.

Bacallao, Mary Kay, Spreadsheet Power: Math in Action GCTM Reflections, v. LI #6, Fall 2006, page 18-19. http://www.gctm.org/reflections/Reflections_v51_n6.pdf

Bacallao, Mary Kay and Michael, Karen, Computers in the Mathematics Classroom, A Tool or a Crutch? Society for Information Technology in Teacher Education, Orlando, Florida, March, 2006.

Bacallao, Mary Kay, Teaching Algebra with Science, MSERA Conference, November, 2005.

Bacallao, Mary Kay, & Lacefield, William Otis, Using Calculators in Calculus Education, MSERA Conference, November, 2005.

Bacallao, Mary Kay & Michael, Karen, Fact or Fiction: Science Explorations that Enhance Critical Thinking Skills, MSERA Conference, November, 2005.

Bacallao, Mary Kay, Lesson Plan Published on the Georgia Learning Connections website, Using Applied Geometry to Solve Problems, Mathematics Lesson Plan for grades 9-12. http://www.glc.k12.ga.us/BuilderV03/lptools/lpshared/lpdisplay.asp?Session_Stamp=&LPID=88368

Bacallao, Mary Kay and Lacefield, William Otis, Using Spreadsheets in Mathematics Teacher Education, Presented by Dr. William Otis Lacefield at the Society for Information Technology and Teacher Education Conference, Phoenix, Arizona, March, 2005.

Bacallao, Mary Kay, Spreadsheets Can Enhance Higher Level Thinking in Mathematics Classrooms, MSERA Conference, October, 2004.

Bacallao, Mary Kay, Enhancing the Traditional Curriculum Course with Technology Resources, Society for Information Technology and Teacher Education, Atlanta, Georgia, March, 2004.

Bacallao, Mary Kay and Lancette, Lenoard, Is "The Required Text" an Endangered Species? , E-Learn World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education, Phoenix, Arizona, November, 2003.

Bacallao, Mary Kay, Bacallao, Aldo, & Frederick, Tom, Multimedia Projects: University Professors Connect with Classroom Teachers, ED Media World Conference on Educational Multimedia, Hypermedia & Telecommunications, p. 977, Honolulu, Hawaii, USA, June 2003.

Bacallao, Mary Kay, Bacallao, Aldo & Frederick, Tom, Just Say No to Drugs and Gangs: Our Class iMovie, ED Media World Conference on Educational Multimedia, Hypermedia & Telecommunications, p. 2883, Honolulu, Hawaii, USA, June 2003.

Bacallao, Mary Kay, & Frederick, Tom, The Digital Video Project Visits the Edison-Ford Museum in Ft. Myers, Florida, ED Media World Conference on Educational Multimedia, Hypermedia & Telecommunications, p. 1658, Honolulu, Hawaii, USA, June 2003.

Fernandez, Antonio, Bacallao, Mary Kay & Bacallao, Aldo, Sixteen Interdisciplinary NETS Technology Units Available On-Line, Society for Information Technology & Teacher Education, International Conference Annual, 2003, p. 3519-3520, Albuquerque, New Mexico, March, 2003.

Bacallao, Mary Kay, & Ambrose, Mary, On-Line Math Lessons with Excel: Interactive Resources for Teacher Education, Society for Information Technology & Teacher Education, International Conference Annual, 2003, p. 2853-2855, Albuquerque, New Mexico, March, 2003.

Bacallao, Mary Kay, Gomez-Wilson, Isabel, Curriculum Technology: How Technology Can Enhance the Standard Curriculum Course, Society for Information Technology & Teacher Education, International Conference Annual, 2003, p. 846-847, Albuquerque, New Mexico, March, 2003.

Lacey, Candace, Enger, John, Kramer, James, & Bacallao, Mary Kay Creating and Using Web-based Evaluation Tools, Society for Information Technology & Teacher Education, International Conference Annual, 2003, p. 742-743, Albuquerque, New Mexico, March, 2003.

Bacallao, Mary Kay, Bacallao, Aldo, Multi-disciplinary E-Learning for Future Educators E-Learn 2002: World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education Proceedings Paper, p. 1148-1149, October, 2002.

Bacallao, Mary Kay, Bacallao, Aldo, How Can University Professors and Elementary School Teachers Work Together in Virtual Teams? E-Learn 2002: World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education Proceedings Paper, p. 1146-1147, October, 2002.

Enger, John; Lacey, Candace; Bacallao, Mary Kay, Bridging the Digital Divide in South Florida: A Virtual Study, Paper Presented at the Annual Meeting of the Florida Educational Research Association, Gainesville, Florida, November 7, 2002. Nominated for the "Distinguished Paper Award."

Bacallao, Mary Kay; Bacallao, Aldo, Bachay, Judy Technology Lesson Plans Based on the Sunshine State Standards and the ISTE Standards, ED-MEDIA World Conference on Educational Multimedia, Hypermedia & Telecommunications Proceedings Paper, p. 63, June 26, 2002.

Bacallao, Mary Kay; Bacallao, Aldo, Technology in the English as a Second Language Classroom, Society for Information Technology in Teacher Education Proceedings Paper, p. 1869, March, 2002.

Bacallao, Mary Kay; Lacey, Candace; Furner, Joseph, PT3 Technology Enhanced Lesson Plans for the Elementary School, Society for Information Technology in Teacher Education Proceedings Paper, p. March 2002.

Bacallao, Mary Kay; Sanders, Paula; Wilson, Carol, Technology Lesson Plans for the Elementary Methods Class, Society for Information Technology in Teacher Education Proceedings Paper, March, 2002.

Bacallao, Mary Kay; Frederick, Tom, Bridging the Digital Divide in South Florida, Society for Information Technology in Teacher Education Proceedings Paper, March, 2002.

Bacallao, Mary Kay; Halvorsen, William, Integrating Technology in the Pre-Service College Classroom and Beyond by Developing Exit E-Portfolios, Society for Information Technology in Teacher Education Proceedings Paper, March 2002.

Featured in Converge: Education, Technology, Fast Forward, *Interactive Classroom Learning Tools,* April 2000.

PRESENTATIONS

Bacallao, M.K. *Building Conceptual Understanding through Representations*. Gallery Workshop, National Council of Teachers of Mathematics Annual Meeting, Philadelphia, Pa. April 27, 2012.

Bacallao, M.K. *Explore Teacher-Developed, Hands-On Materials for Important Elementary School Math Concepts*. Gallery Workshop, National Council of Teachers of Mathematics Regional Meeting, Albuquerque, New Mexico, November 4, 2011.

Bacallao, M.K. *Explore Teacher-Developed, Hands-On Materials for Important Elementary School Math Concepts*. Gallery Workshop, National Council of Teachers of Mathematics Regional Meeting, St. Louis, Missouri, October 27, 2011.

Bacallao, M.K. *Let's Play: Math Learning Games with Friends.* Gallery Workshop, National Council of Teachers of Mathematics Annual Meeting. Indianapolis, Indiana, April 15, 2011.

Bacallao, M. K. *Numeracy through Play*, Georgia Association on Young Children Conference: More Than the Basics! For Experienced Teachers. 8:00AM- 10:00AM, February 12, 2011.

Bacallao, M.K. *Four New Manipulatives for Elementary Math Students*. National Council of Teachers of Mathematics Regional Conference. New Orleans, Louisiana, October 28, 2010.

Bacallao, M. K., *Quadrilateral pieces: A geometry puzzle for problem solving.* Concurrent Session, National Council of Teachers of Mathematics Regional Conference and Exposition, Boston, MA. October 23, 2009.

Bacallao, M. K., *Brain based learning with the basic facts*. Gallery Workshop, National Council of Teachers of Mathematics Regional Conference and Exposition, Minneapolis, MN, November 5, 2009.

Bacallao, M. K., *Math games for brain power with the basic facts.* National Council of Teachers of Mathematics Regional Conference and Exposition, Nashville, TN, November 20, 2009.

Bacallao, M. K., Whatley, C., and Khoury, H., *Developing numeracy*. Sowing Seeds for Success in the New Decade. Georgia Head Start Conference, St. Simons Island, May 13, 2010.

Bacallao, M. K., *A new math game for reasoning about the basic facts*, April 23, 2009, National Council of Teachers of Mathematics Annual Meeting and Exposition, Washington, D.C.

Bacallao, M. K., *Let's play! Learning games with friends*, Saturday, March 28th, 2009, Aspire to Reach Higher… TEACH! F.E.A.S.T. FEA Spring Training, Epworth by the Sea, St. Simon's Island, Georgia.

Bacallao, M. K., Quadrilateral *Pieces: A geometry puzzle for authentic problem solving*, Friday, October 17, 2008, 56th Annual State Conference, Florida Council of Teachers of Mathematics, Jacksonville, Florida.

Bacallao, M. K., *Memory games for the basic facts*, October 15, 2008, The 49th Annual Georgia Mathematics Conference, Rock Eagle 4-H Center, Decision 2008: Mathematics: The Winning Ticket, Rock Eagle, Georgia.

Bacallao, M. K., *Quadrilateral pieces: A geometry puzzle*, October 15, 2008, The 49th Annual Georgia Mathematics Conference, Rock Eagle 4-H Center, Decision 2008: Mathematics: The Winning Ticket, Rock Eagle, Georgia.

Bacallao, Mary Kay and Michael, Karen, *Teaching Strategies for Diverse Urban Learners*. Georgia National Association for Multicultural Education, Atlanta, Georgia, March 9, 2007.

Bacallao, Mary Kay and Norby, Rena Faye *Problem Solving with a Purpose* GCTM Conference, October 19, 2006.

Norby, Rena Faye and Bacallao, Mary Kay, Connected Math Workshop, Funded by Title II Funds, Douglas County Teachers, Summer 2006.

Bacallao, Mary Kay and Michael, Karen, *Fact or Fiction: Science Explorations that Enhance Critical Thinking*, NSTA Southern Regional Convention, Nashville, Tennessee, Dec. 1, 2005.

Bacallao, Mary Kay, *Using Science Concepts to Teach Mathematical Problem Solving*, Georgia Mathematics Conference, Rock Eagle 4-H Center, October 22, 2005.

Bacallao, Mary Kay and Lacefield, William Otis, *Problem Solving with Excel: Interactive Applications of Real World Math*, NCTM Regional Conference, Birmingham, Alabama, October 20, 2005.

Bacallao, Mary Kay and Lacefield, William Otis, *Solving Real-World Math Problems with Excel*, National Educational Computing Conference, Philadelphia, Pennsylvania, June 29, 2005.

Bacallao, Mary Kay and Lacefield, William Otis, *Unique Middle Grades Spreadsheet Lessons Based on the NCTM Standards*, Florida Educational Computing Conference, Orlando, Florida, January 27, 2005.

Bacallao, Mary Kay and Lacefield, William Otis, *Using Spreadsheets to Teach Middle Grades Math*, Georgia Mathematics Conference, Eatonton, Ga. October 16, 2004.

Gardner, Cathy and Bacallao, Mary Kay, *Overcoming Barriers to Implementing Technology in the Middle School Science/Mathematics Classroom*, School Science and Mathematics Association, 2004 Annual Convention, Atlanta, Georgia, October 21, 2004.

Lacefield, William Otis, and Bacallao, Mary Kay, *Using Children's Literature to Teach NCTM Standards*, Georgia Mathematics Conference, Eatonton, Ga. October 16, 2004.

Bacallao, Mary Kay, and Lacefield, William Otis, *Using Excel Templates to Teach NCTM Standards*, National Educational Computing Conference, New Orleans, Louisiana, June 26, 2004.

Bacallao, Mary Kay and Bacallao, Aldo, *Partnerships with Purpose: Teacher Education, K-12 Educators, and Business Work Together to Enhance Pre-Service Teacher Education*, GACTE/GATE/GAICTE, Brasstown Valley Resort, March 25, 2004.

Bacallao, Mary Kay, *Online Math Lessons with Excel: Interactive Resources for Classroom Use*, National Educational Computing Conference, Seattle, Washington, July 1, 2003.

Wilson, Carol & Bacallao, Mary Kay, *PT^3 Collaboration + Technology Integration = Thematic Units*, National Educational Computing Conference, Seattle, Washington, July 1, 2003.

Bacallao, Mary Kay, Bacallao, Aldo, Lacey, Candace *On-line Virtual Teams* The Eighth Sloan-C International Conference on Asynchronous Learning Networks (ALN): The Power of On-Line Learning: The Faculty Experience, Orlando , Florida, November 9, 2002.

Bacallao, Aldo; Bacallao, Mary Kay, *PT3 Video Theatre: DARE, Drug Abuse Resistance Education*, Preparing Tomorrow's Teachers To Use Technology National Grantee Meeting, Washington, D.C., July 24, 2002.

Blackwell, Ed; Bacallao, Mary Kay, *Building and Sustaining K-12 to Higher Education Relationships with Technology*, Roundtable, Preparing Tomorrow's Teachers To Use Technology National Grantee Meeting, Washington, D.C., July 25, 2002.

Lacey, Candace; Enger, John; Bacallao, Mary Kay, *We Did, You Can! Collecting Quantitative and Qualitative Data Online*, Preparing Tomorrow's Teachers To Use Technology National Grantee Meeting, Washington, D.C., July 24, 2002.

Bacallao, Mary Kay; Bacallao, Aldo; Blackwell, Ed; Lacey, Candace, *National and State Standards Integration: Integrating the ISTE Standards*, Preparing Tomorrow's Teachers To Use Technology National Grantee Meeting, Washington, D.C., July 26, 2002.

Bacallao, Mary Kay; Bacallao, Aldo; Wilson, Carol; *Technology Lesson Plans for the Elementary Methods Class*, National Educational Technology Conference, San Antonio, Texas, June 17, 2002.

Bacallao, Mary Kay; Bacallao, Aldo, *Technology Lessons for English as a Second Language Students*, ED-MEDIA World Conference on Educational Multimedia, Hypermedia & Telecommunications, June 26, 2002.

Lacey, Candace; Enger, John; Kramer, James; Bacallao, Mary Kay; *Data Collection on the Web*, ED-MEDIA World Conference on Educational Multimedia, Hypermedia & Telecommunications, June 26, 2002.

Bacallao, Mary Kay; Halvorsen, William; *Technology Lesson Plans for the Elementary Methods Class: Reaching Ethnically Diverse Students,* Florida Educational Technology Conference, March 7, 2002.

Wiburg, Karin; Sibley, Robert; Bacallao, Mary Kay; *Advancing Digital Equity in Teacher Education: Building a PT3 Digital Equity Community*, Florida Educational Technology Conference, March 8, 2002.

Bacallao, Mary Kay; Lacey, Candace, *Lessons Learned from Bridging the Digital Divide in South Florida*, Preparing Tomorrow's Teachers To Use Technology National Grantee Meeting, Washington, D.C., August, 2001.

Bacallao, Mary Kay, *Bridging the Digital Divide in South Florida*, WebNet 2001 World Conference on the WWW and the Internet, October 25, 2001.

Bacallao, Mary Kay, *Create Your Own Science Show*, National Science Teachers Association 2000 National Conference, April 7, 2000.

INSTITUTES/TRAININGS

National Urban Alliance Summer Academy, July 16-20, 2007, Albany, New York.

National Urban Alliance Inductee Institute, Glen Cove, New York, August, 2006.

PT3 National Digital Equity Task force, assisted in organizing the Digital Equity Symposium, Society for Information Technology in Teacher Education on March 18, 2002.

Project START, Southeast Student Teachers Are Revitalizing Teaching Through Technology, Master Trainer, Miami Museum of Science Master Trainer Institute, September, 2000.

Intel®Teach to the Future with Support from Microsoft Certified Faculty Trainer, Miami Museum of Science Pre-Service Program, June 2001.

ISTE National Forum Educational Technology Standards for Teachers, contributing attendee, Washington, D. C., December 1999.

REPORTING TO STATE AND FEDERAL AGENCIES

Wrote the Florida State Teacher Accreditation report for the Florida Department of Education at St. Thomas University in 2000, 2001, 2002, and 2003.

Completed the mid-year, annual evaluation and cost expenditure reports for the Preparing Tomorrow's Teachers to Use Technology grants for FY 99, FY00, FY01 and FY 02.

INTERESTS & ACTIVITIES

Member of the Honor Society of Phi Kappa Phi
Member of the Honor Society of Delta Kappa Phi
Tennis, sand volleyball
Gardening

AWARDS RECEIVED

Strategy Game of the Year for 2011, Creative Child Magazine, Equals: The Game of Strategy for the Basic Facts
Seal of Excellence, 2011, Creative Child Magazine, STAR 10: A Learning Tool for Numeracy
Little Red Schoolhouse Award for the Welleby's World of Science, 1996
Nominee for the Presidential Award for Excellence in Science and Mathematics Teaching, 1994
Inviting Students to Learn- First Place Winner, 1990
Who's Who in American Colleges and Universities, 1988
The National Dean's List, 1988
Most Enthusiastic Award, Miami Christian College cheerleading, 1988
Coach's Award, College Volleyball, 1988
Miami Herald Silver Knight Nominee for Math, 1986
Bauche and Lombe Honorary Science Award, 1986
Highest Achievement in Math Award, 1986
Award for highest GPA in the senior year at Madonna Academy, 1986
Accepted to the Governor's Florida Foundation for Future Scientists program, 1986
National Honor Society, 1984-1986
Spanish Honor Society, 1984-1986
National Association of Hispanic Journalists, Award Winning Essay, 1986
Most Valuable Player, Varsity Tennis Team, 1984

OTHER EXPERIENCES

Tenure Promotion and Review Committee, Mercer University, 2008-2010, *Chair,* 2009-2010
Faculty Executive Committee, Mercer University, 2005-2007, *Chair,* 2005-2006
Secretary, Faculty Forum, St. Thomas University, 2002-2003
Secretary/Senator, United Faculty of Florida, St. Thomas University, 2001-2003
Executive Secretary, Student Government Association, Miami Christian College, 1987-1988

Experience with diverse ethnic populations
Bilingual: Fluent in Spanish.
ESOL certified, experience teaching ESOL students.
Two years teaching experience where 100% the student population was African American, Haitian, Jamaican, or from the Bahamas.

Experience in developing and implementing innovative media/public relations programs
Created, developed and produced Welleby's World of Science, an in-house television broadcast which featured the students as scientists. The show featured over 100 scientists, 1,200 viewers, and 4 years of production. Collaboration with other elementary schools, including the Coalition of Safe Schools and the National Safety Council.

Behavior Management and School Safety Programs
The Welleby Scientists produced video material on safety that the Coalition of Safe Schools and the National Safety Council have used in the state of Florida and presented at their national convention.

Standardized Testing
Proficient use of SPSS statistics package used to track student standardized test scores.
Tabulated statistics of test scores for grades 3-5 at Welleby Elementary for three years, using SPSS.
SACS (Southern Association of Colleges and Schools) in-county observer, 1995.

FUNDED PROPOSALS

Funding Year	Amount	Funding Source
1999	$143,400	U.S. Department of Education
2000	$413,975	U.S. Department of Education
2000	$ 27,000	U.S. Department of Education
2001	$409,072	U.S. Department of Education
2001	$ 62,683	U.S. Department of Education
2001	$ 21,000	U.S. Department of Education
2002	$327,258	U.S. Department of Education
2002	$ 2,498	Intel/Smart Technologies
2005	$306,246	State of Georgia
2010	$ 3,000	Mercer University Seed Grant