

Successful Transition from Math Eight to Math I

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Math Team Activities



Abstract

North Carolina adopted the North Carolina Common Core State Standards (NCCCSS) in K-12 Mathematics and K-12 English Language Arts on June 2, 2010 that were released by the National Governors Association Center for Best Practices and the Council of Chief State School Officers. With the adoption of these state-led education standards, North Carolina is in the first group of states to embrace clear and consistent goals for learning to prepare children for success in college and work. Under the Mathematics Standards, Math I, commonly known as Algebra I, is considered the gatekeeper for students who are college or career ready. There is a significant need to encourage and prepare a higher percentage of minority and non-traditional high school students to pursue careers in the areas of science, technology, engineering and mathematics (STEM) on a national level. High school freshman from schools the twenty-one county region that falls under the school divisions assigned to Elizabeth City State University (ECSU) consistently perform poorly in Math I on the End of Course (EOC) state test annually. This team will seek to examine the challenges to be overcome by eighth grade students to be successful on the Math I state assessment taken at the conclusion of their first semester in five high schools located in three selected school divisions that are in close proximity to ECSU. The Math Team will focus on the skills of North Carolina students that are required to successfully transition from Math 8 to Math I in the North Carolina Common Core Standards for Mathematics.

Key Words: North Carolina Common Core State Standards for Mathematics (NCCCSS), End of Course Tests, STEM

Purpose

The purpose of this research is to find the best practices that are considered as solutions to meet the challenges of preparing Math I students from Pasquotank, Perquimans, and Washington County School districts the goal is to enhance the teaching strategies that will enable students to be successful on the end of course state test.

Understanding the factors that influence student success in Math I enhances opportunities for college entrance and career goals that may potentially increase participation in science, technology, engineering, and mathematics (STEM).

Focus Questions

- Does an effective philosophy of teaching and learning enhance student learning?
- How does understanding student knowledge of math content impact student success?
- What professional development activities assist in building student test taking skills?

Questionnaire Instrument



CERSE

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Elizabeth City State University <http://cerse.ecsu.edu>

Algebra I Teachers

Interview Question Prompts:

• What is your teaching philosophy?	
• What five words would you use to describe yourself as a teacher?	
• Describe your teaching style?	
• What type of classroom management structure do you implement?	
• What technology is used to support your teaching?	
• How do you communicate student progress to parents?	
• Tell me how you develop your daily lesson plan and what do you include?	
• What is your system for evaluating student work?	
• What do you do if a lesson doesn't work well?	
• Could a student of low academic ability receive a high grade in your classes?	

The 2014 mathematics team used a questionnaire to assess the perceived challenges for successful transition from Math 8 to Math I. The information gained from the questionnaire was used to identify the best practices in Math I for North Carolina to improve student achievement on EOC assessments. With input from the teams mentor, the math team developed a 10-item questionnaire used for data collection with mathematics teachers from Pasquotank, Perquimans and Washington Counties whose EOC Math I test scores for 2010-2012 were significantly low.

Interview Responses

What is your teaching philosophy?

All students can learn

Learning requires structure

Failure is not an option

Practice makes perfect

Five words that describe yourself as a teacher

Motivated knowledgeable patient dedicated discipline

Teaching style

Firm, hands on collaboration, facilitator, showing examples, practice, direct instruction supported through engaged learning activities

Classroom management

Structure, routine, organized, cooperative learning, strict

Technology used

Calculator, projector, iPad, SMARTboard, document camera

Interview Responses cont.

Communication to parents

Online grade book (Power School), phone call, email, letters, parent teacher conference, progress reports

Daily lesson plan

Standards, learning outcome, pacing guide, objectives (I can...), examples

Evaluating student work

Tests, quizzes, classwork, homework, projects, rubrics, daily warm up, exit tickets

What do you do if the lesson doesn't work well?

Reteach, collaborate with other teachers, group work, review

Could a student of low academic ability receive a high grade?

With the right amount of effort from the student (few said no), Performance based not ability.

Interview Response Breakdown

Middle and high school mathematics teachers in Pasquotank, Perquimans, and Washington County School Districts must take deliberate action at all stakeholder levels to use data-driven analysis for school improvement is required to close the achievement gap.

- Model an openness and willingness to use data to enhance teaching and learning.
- Use quantitative and qualitative data sources to improve instruction and better understand student thinking and learning, including test results, portfolios, homework, student conferences, journals, classroom observations, and portfolios.
- Work collaboratively with other teachers and school leaders to develop documented patterns of evidence of student learning and to identify areas needing improvement.
- Identify and share evidence-based instructional techniques that increase student achievement.

Best Practices

Best Practices: Ways Teachers Can Keep Common Core Standards Math Scores High

Common Core State Standards (CCSS) are changing the educational system throughout the United States and are designed to improve student achievement, teachers need to find ways to provide instruction that keeps math scores high and still follow the CCSS standards.

Best Practice #1: Selecting and using meaningful algebraic tasks

Best Practice #2: Stimulating classroom discourse

Best Practice #3: Creating a positive algebraic learning environment

Best Practice #4: Analyzing teaching and learning in algebra

Best Practice #5: Prioritize Classroom Information

Best Practice #6: Discuss Lesson Plans with Other Teachers

Best Practice #7: Provide Creative Educational Solutions

Sample/Participants

TABLE I. Frequency Distribution for Participant Demographics

Mathematics Teachers from Pasquotank, Perquimans, & Washington County Schools		
	Math I	Math 8
Pasquotank County		
Northeastern High	4	
Pasquotank High	3	
Elizabeth City Middle		3
River Road Middle		2
Perquimans County		
Perquimans Middle		3
Perquimans High	2	
Washington County		
Creswell High	2	
Plymouth High	4	
Washington County Union		7

The data collected and analyzed in this study is from the data collection that took place with 27 mathematics teachers from Pasquotank, Perquimans and Washington counties in northeastern North Carolina during the spring of 2014 school year. 44% of the teachers taught Math 8 and 56% of the teachers taught Math I. There was a 100 % response rate for teacher questionnaires and surveys.

Survey

Our survey was broken down into five sections, the last two both focused on staff development:

Understanding Student Culture

Formal & Informal Staff Development Participation

Student Response to Classroom Instruction

Formal Staff Development Participation



Algebra I Teacher Survey

This questionnaire is designed to assess challenges your students faced to obtain a level of success in Algebra I. Completion of this survey should require about 5 minutes of your time. Please give each statement relevant thought in your response. Your responses will remain confidential.

Gender: M F

Number of Years Teaching: _____

Indicate the extent to which you agree or disagree by filling in the appropriate bubble. Please address your response based on the statements which range from "1" Strongly Disagree to "5" Strongly Agree as they are represented across the row.

1	2	3	4	5
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Please indicate the extent to which you agree or disagree with the following statements.

Have an awareness of previous knowledge level before working with a new group of students.	<input type="checkbox"/>				
Students are expected master the content before moving on to new topics.	<input type="checkbox"/>				
Frequently collaborated with my students' former math teachers about teaching strategies.	<input type="checkbox"/>				
Know that other math teachers are working with students at the same level of achievement and using similar teaching methods to cover the same content.	<input type="checkbox"/>				
Teachers of former students easily assess student learning from my classes.	<input type="checkbox"/>				

To what extent do you agree with the following statements on both formal (staff development) and informal (conferring with a colleague)?

Provided me with knowledge that was useful in the classroom to enhance student learning.	<input type="checkbox"/>				
Workshop sessions were coherently related to each other.	<input type="checkbox"/>				
Focused on too many topics.	<input type="checkbox"/>				
Provided me with useful feedback about my teaching.	<input type="checkbox"/>				
Led me to try new things in the classroom that led to student success.	<input type="checkbox"/>				

My Algebra I students targeted class instruction by...

Assessing a problem and choosing a method to use from those already introduced.	<input type="checkbox"/>				
Performing tasks requiring methods or ideas not already introduced.	<input type="checkbox"/>				
Explaining an answer or a solution method for a particular problem.	<input type="checkbox"/>				
Analyzing similarities and differences among representations, solutions, or methods.	<input type="checkbox"/>				
Working on mathematics textbook, worksheet, or board work exercises for practice or review.	<input type="checkbox"/>				

Indicate your level of agreement with professional development sessions you participated in this school year that focused on the following topics:

Student assessment.	<input type="checkbox"/>				
Curriculum materials or frameworks.	<input type="checkbox"/>				
Use of technology in instruction.	<input type="checkbox"/>				
Multicultural or diversity issues that affect student learning outcomes.	<input type="checkbox"/>				
Parent involvement that enhance student performance in Algebra I.	<input type="checkbox"/>				

Considering professional development opportunities you experienced in mathematics this past year, time and effort was devoted to the following...

Analyzing Algebra I curriculum materials.	<input type="checkbox"/>				
Improving student skills at designing mathematics tasks for individual students.	<input type="checkbox"/>				
Improving student understanding of knowledge of patterns, functions, or algebra.	<input type="checkbox"/>				
Extending student knowledge of different representations for number concepts	<input type="checkbox"/>				
Extending student knowledge of different representations for operations or computation	<input type="checkbox"/>				

Survey Questions Group A

Understanding Student Culture

	Agree	Neutral	Disagree
Have an awareness of previous knowledge before working with a new group of students.	20	6	1
Students are expected to master the content before moving on to new topics.	18	6	3
Frequently collaborated with my students' former math teachers about teaching strategies.	15	3	9
Know that other math teachers are working with students at the same level of achievement and using similar teaching methods to cover the same content	19	5	3
Teachers of former students easily assess student learning from my classes	19	5	3

Survey Questions Group A

Understanding Student Culture

- 74% of teachers agreed that they have awareness of students previous knowledge level before working with a new group of students, 22% said neutral, 4% said disagree.
- 67% of teachers agreed that students are expected to master the content before moving onto new topics, 22% answered neutral, 11% disagreed
- 56% of teachers agreed that they frequently collaborated with students former math teachers about teaching strategies, 11% answer neutral and 33% disagreed.
- 70% of teachers said that they are working at the same level of achievement and using similar teaching methods, 19% answered neutral, and 11% disagreed.
- 70% of teachers said that teachers of former students can easily access students learning from their class, 19% answered neutral, and 11% disagreed.

Survey Questions Group B

Formal and Informal Staff Development Participation

	Agree	Neutral	Disagree
Provided me with knowledge that was useful in the classroom to enhance student learning	22	3	2
Workshop sessions were coherently related to each other	14	11	2
Focused on too many topics	16	6	5
Provided me with feed back about my teaching	16	4	7
Led me to try new things in the classroom that led to student success	19	5	3

Survey Questions Group B

Formal and Informal Staff Development Participation

- 81% agreed that they were provided with knowledge that was useful in the classroom to enhance student learning, 7% disagreed and, 11% were neutral.
- 51% agreed that Workshop sessions were coherently related to each other, 7% disagreed, and 40% were neutral.
- 59% agreed that they were focused on too many topics, 18% disagreed, and 22% were neutral.
- 59% agreed that they were provided with feed back about my teaching, 25% disagreed, and 14% were neutral.
- 70% agree that they were led to try new things in the classroom that led to student success, 11% disagreed, and 19% were neutral.

Survey Questions Group C

Student Response to Classroom Instruction

	Agree	Neutral	Disagree
Assessing a problem and choosing a method to use from those already introduced	19	5	3
Performing tasks requiring methods or ideas not already introduced	14	8	5
Explaining an answer or solution method for a particular problem	19	5	3
Analyzing similarities and differences among representations, solutions, or methods.	20	4	3
Working on mathematics textbook, worksheet, or board work exercises for practice or review.	18	6	3

Survey Questions Group C

Student Response to Classroom Instruction

- 70% agreed to Assessing a problem and choosing a method to use from those already introduced, 11% disagreed, and 19% were neutral.
- 52% agreed to performing tasks requiring methods or ideas not already introduced. 18% Disagreed, and 30% were neutral
- 70% agreed to explaining an answer or solution method for a particular problem, 11% disagreed, and 19% were neutral.
- 74% agreed to analyzing similarities and differences among representations, solutions, or methods, 11% disagreed, 15% were neutral.
- 67% working on mathematics textbook, worksheet, or board work exercises for practice or review. 11% disagreed, 22% were neutral.

Survey Questions Group D

Formal Staff Development I

	Agree	Neutral	Disagree
Student assessment	16	3	8
Curriculum materials or frameworks	16	5	6
Use of technology in instruction	16	8	3
Multicultural or diversity issues that affect student learning outcomes	11	6	10
Parent involvement that enhance student performance in Algebra I	7	10	10

Survey Questions Group D

Formal Staff Development I

- 59% agreed to student assessment 33% disagreed, and 11% were neutral.
- 59% agreed to curriculum materials or frameworks, 22% disagreed, and 18% neutral.
- 59% agreed to use of technology in instruction, 11% disagreed, and 33% were neutral.
- 41% agreed to multicultural or diversity issues that affect student learning outcomes, 37% disagreed, and 22 were neutral.
- 26% agreed that parent involvement that enhance student performance in Algebra I, 37% disagreed and 37% were neutral.

Survey Questions Group E

Formal Staff Development II

	Agree	Neutral	Disagree
Analyzing Algebra I curriculum materials	16	4	7
Improving student skill at designing mathematics tasks for individual students	16	4	7
Improving student understanding of knowledge of patterns, functions, or algebra	18	2	7
Extending student knowledge of different representations for number concepts	15	5	7
Extending students knowledge of different representations for operations or computation	16	3	6

Survey Questions Group E

Formal Staff Development II

- 59% agreed about analyzing Algebra I curriculum materials 26% disagreed, 14% were neutral.
- 59% agreed about Improving student skill at designing mathematics tasks for individual students, 26% disagreed, 14% were neutral.
- 67% agreed that Improving student understanding of knowledge of patterns, functions, or algebra, 26% disagreed, 7% were neutral.
- 56% agreed that extending student knowledge of different representations for number concepts, 26% disagreed, 19% were neutral.
- 59% agree extending students knowledge of different representations for operations or computation, 22% disagreed, 11% were neutral.

Data/Results

.	# Years Teaching	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	33	3	4	2	3	3	4	3	4	5	5
1	22	3	4	4	4	3	4	3	5	5	5
1	18	3	1	1	1	3	3	3	5	3	5
1	17	3	4	2	2	2	3	3	5	3	3
1	16	4	5	4	5	5	3	3	5	5	4
1	16	5	3	4	4	4	4	4	4	4	4
1	16	3	4	2	3	3	4	4	4	4	4
1	15	3	4	2	3	3	2	3	4	2	3
1	13	2	1	1	2	2	2	2	4	1	3
1	13	4	4	5	3	4	4	4	4	5	1
1	12	4	3	2	3	3	4	3	4	4	5
1	12	4	3	2	4	4	4	3	4	2	4
1	11	5	5	5	4	4	5	5	2	2	4
1	11	4	5	5	5	4	5	5	2	5	2
1	10	4	5	5	4	4	5	5	2	4	3
1	10	5	5	4	4	4	4	4	2	4	4
1	10	4	4	4	4	5	4	5	3	3	4
1	8	5	5	5	5	5	4	4	3	3	4
1	8	4	4	3	5	4	4	4	3	3	4
2	7	4	3	3	4	3	4	3	3	4	3
2	7	4	2	1	4	1	4	1	3	4	5
2	6	5	5	4	5	5	5	5	3	5	5
2	6	5	5	4	4	5	5	4	2	5	4
2	5.5	4	4	4	5	5	5	5	4	4	4
2	5	5	5	5	4	5	5	5	4	4	4
2	4	5	3	3	4	4	4	3	4	3	5
2	3	4	3	4	4	3	4	3	4	2	1

This spreadsheet is a breakdown of all the teacher surveys collected. Column one shows gender; 1-female 2-male.

Conclusion

- The results of the questionnaire and survey concluded that math teacher effectiveness demonstrated contributions to growth in student learning. Good middle and high school teachers accomplish other things, including motivating and engaging students, acquiring new knowledge and skills, and collaborating with colleagues.
- These accomplishments best serve their purpose when they lead teachers to improve student achievement.
- Appropriate professional development gives teachers the tools they need to implement best practices, which support students and prepares them for the Math I EOC.
- The best way to improve teacher effectiveness is to provide teachers with support and guidance that are grounded in effectiveness—that is, which uses effectiveness data to enhance professional development, teacher education, and encourage student learning.

Future Work

- The 2014 math research team plans to present findings of this research to the involved school districts as well as at local, regional, and state mathematics education conferences and submit this manuscript for IEEE publication.
- Two goals came to play a central role:
 - Identifying ways in which mathematics teachers use professional development in a specific academic and social context to assist their students.
 - Identifying the knowledge, resources, experiences, and rationales mathematics teachers draw on to assist students in becoming successful on state assessments.

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