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Abstract
Project AAIMS (Algebra Assessment and Instruction: Meeting Standards) is a federally funded project that has two objectives. The first is to examine the alignment of algebra 1 curriculum, instruction, and assessment in general and special education. The second is to develop and validate algebra assessment tools for use in general and special education classes. This case study focuses on the first objective – it examines the alignment of algebra curriculum, instruction, and assessment for students with and without disabilities in one of the three districts participating in Project AAIMS.

Disciplines
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Comments
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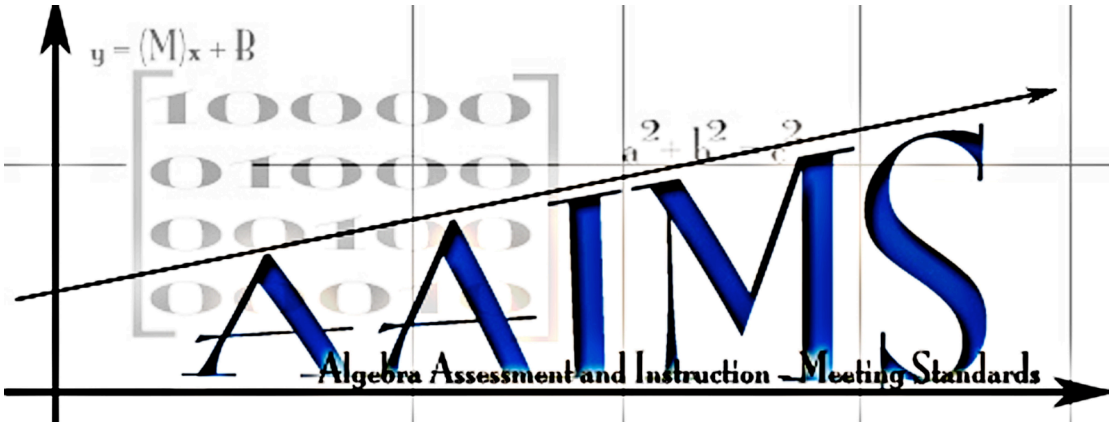
PROJECT AAIMS: ALGEBRA ASSESSMENT AND INSTRUCTION – MEETING STANDARDS



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Project AAIMS (Algebra Assessment and Instruction: Meeting Standards) is a federally funded project that has two objectives. The first is to examine the alignment of algebra[1] curriculum, instruction, and assessment in general and special education. The second is to develop and validate algebra assessment tools for use in general and special education classes. This case study focuses on the first objective – it examines the alignment of algebra curriculum, instruction, and assessment for students with and without disabilities in one of the three districts participating in Project AAIMS.

We begin this case study by describing our data sources. This description is followed by background information about District C, a brief description of the teachers and students who participated in this project, and a summary of the algebra curriculum in this district. Next, we take a closer look at algebra instruction in District C, as well as discuss the district's assessment results. We conclude the case study by addressing our findings related to the alignment of curriculum, instruction, and assessment for students with and without disabilities in this school district.

Sources of Data

In an attempt to explore the similarities and differences in curriculum, instruction, and assessment for general education and special education students enrolled in District C's algebra classes, the research team gathered information for this case study during the fall of 2004 using a variety of methods. We reviewed documents, conducted nine observations of algebra classes, and interviewed teachers and an administrator.

Document Review

Members of the research team analyzed the district's annual progress reports, comprehensive school improvement plan, website, and algebra textbook. We also examined the Iowa School Profile for this district on the Iowa Department of Education website, as well as student algebra grades and standardized test math scores for students from whom we had student and parent consent for additional information about algebra achievement. Our goal in conducting this review was to identify District C's established curriculum, instruction, and assessment guidelines, as well as its achievement results.

Observations

Two types of classroom observations were conducted concurrently. The first type used a systematic, momentary time sampling observation system, while the second type used an anecdotal observation form to document aspects of instruction that may not have been captured with the former system.

Whereas the momentary time sampling observations used predetermined codes and

[1] Throughout this case study any time we refer to algebra, we mean beginning algebra courses such as Algebra I.

required observers to record only the most prevalent student behavior, teacher behavior, instructional organization, and task format, the codes for the expected tasks, teacher actions, and student actions during the anecdotal observations were derived after all the data had been collected. (See Olson and Foegen, 2006 for a thorough description of the momentary time sampling observation results and Olson and Foegen, 2007 for a comprehensive examination of the anecdotal observation data.) We believe that by using these two observation methods we were able to develop a more complete depiction of the algebra curriculum and instruction approaches used in District C's algebra classes.

Interviews

Three group interviews were conducted with the participating teachers. During one of the interviews questions were asked of all the teachers. Later, the general education teachers and then the special education teachers were interviewed as separate groups. A district administrator was also interviewed. All of the interviews were tape recorded and transcribed for later review and analysis. (See Appendix A for a copy of the interview protocols.)

Having the opportunity to analyze data from multiple sources allowed us to develop a more complete description of the algebra curriculum, instructional practices, and assessment approaches for students with and without disabilities in District C. This description begins with some background information about the district.

The School District

District C serves five small towns and a Native American settlement. Approximately 17,700 people reside in the school district, of which 1600 are students. The senior high school has an enrollment of about 450 students; about 15 percent of these students receive special education services. Approximately 44 percent of the district's students are eligible for free and reduced lunch, and 25 percent are of diverse backgrounds in terms of race, culture and ethnicity.

The district has a mobility rate of 33%, which means that one third of the students either move into or move out of the district's schools over the course of an academic year. Approximately 83% of District C's graduates plan to pursue post-secondary education or training. Of the students who took the ACT exam, nearly 66% earned a score of at least during the 2004-2005 academic year. The dropout rate for this school year was 3.74% of the student population in grades 7-12 (20 students). The dropout rate for students with IEPs was 3.7%, which was less than the rate for Native American students (6.43%), Hispanic students (5.77%), and lower SES students (4.59%).

The Teachers

Two general education teachers' classes were observed. Both teachers held initial Iowa teacher's licenses with 7-12 mathematics endorsements. Each teacher had earned a Bachelor's degree and had one year of teaching experience. Two special education teachers also consented to be part of this project, but they did not teach any classes that were observed for this study.

The Students

Student participants included 45 youth in the ninth through twelfth grade who were currently enrolled in Algebra I. We hoped to have general education and special education students participate in this study; however, there were no special education students enrolled in the algebra classes taught by the District C teachers who chose to participate in Project AAIMS during Fall 2004. (There were students with disabilities enrolled in these classes in subsequent semesters. For example, there were four students with disabilities during the fall of 2005 and six students with IEPs during Spring 2006.)

The Curriculum

Four terms of math are required for graduation in District C. The high school offered many different math options (e.g., Basic Math 1, Basic Math 2, Algebra Topics, Algebra 1, Geometry); therefore, students were not required to take Algebra I to graduate. Nevertheless, a majority of the students in District C do take Algebra I before they graduate.

At the time of this study, District C's high school offered two alternatives for initial algebra instruction. Students could choose between Algebra I or Algebra Topics. District C uses block scheduling[2]; therefore, students in Algebra I take one-half of an academic year to complete the course, and students in the Algebra Topics option can spread their beginning algebra instruction over a full year. This slower pace is intended to allow students additional time to master the concepts of algebra.

Algebra is one strand of the Mathematics Standards for District C. There are three strand goals related to Algebra. These are:

The student develops an algebraic thinking mode.
The student demonstrates a fundamental background in algebra to enable success in advanced studies.
The student demonstrates algebraic skills at home and on the job to live effectively in today's world.

The district's 2001-2006 comprehensive school improvement plan lists 93 objectives for algebra that are included in the college math column. This chart indicates whether skills are to be introduced, focused on, or expanded upon during a particular course. We observed lessons that addressed skills that were being introduced and focused on (writing the equation of a line and systems of linear equations), skills that were being focused on (integers), and skills that were being expanded upon (distributive property and order of operations).

The district adopted new mathematics textbooks in 2001. All of the Algebra I classes

[2] Students usually take four classes each semester that meet for 90 minutes each day.

used the same textbook, *Algebra I*, which is published by McDougal Littell (Larson, Boswell, Kanold, & Stiff, 2001). This textbook was chosen because it was a good match with the district's standards and benchmarks.

Even though the three Algebra I classes were taught by two different teachers, the students were studying basically the same topics during each of the observations, which occurred on the same days. Our first observation was conducted at the end of the first quarter of the academic year; therefore, we were not surprised to see all of the classes engaged in cumulative reviews of the first five chapters of the book in addition to wrapping up their study of chapter 6, which focuses on solving and graphing linear inequalities. During our second observation all of the classes were learning how to solve linear systems, which is a topic from chapter 7. By the time we made our last observation, the teachers had progressed to solving quadratic equations in chapter 9.

Algebra Instruction in District C

This section of the case study will focus on instruction in Algebra I classes that we observed during the fall of 2004. One of our observations was conducted at the end of October and two others occurred in November. What follows is a glimpse at Algebra I instruction in District C, drawing from the observation and interview data.

Algebra I

There were three sections of Algebra I that were included in this study. One general education teacher (Teacher 1) taught one section during first block (8:30 – 10:00 AM). The other general education teacher (Teacher 2) also taught Algebra I during first block and then taught an additional section during fourth block (1:54 – 3:24 PM). A total of 45 students were enrolled in the Algebra I classes we observed. Class sizes ranged from 12 to 19 students. There were no students with disabilities enrolled in the Algebra I classes we observed in the fall of 2004.

The teachers' classrooms were very different. Teacher 1 did not have his own classroom, he moved from one classroom to another throughout the day. For first block, he and his Algebra I students were assigned to the building's distance education classroom with rows of tables with microphones, padded swivel chairs, and a large console at the front of the room with several kinds of technological devices such as a document projector and a computer with a monitor. There were white boards at the front and on the right side of this classroom. There were no students taking the class from remote locations; therefore, the students did not use the microphones during the lessons we observed.

In Teacher 2's classroom the student desks were arranged in rows facing the front of the classroom. There were white boards at the front and the back of the classroom. Teacher 2 had positioned his desk at the back left side of the classroom.

The algebra teacher with one section (Teacher 1) used a similar structure for most of our observations. He always started with a warm up activity that was usually followed by

checking homework, the main activity for day, and then a wrap up activity. The warm up took five minutes during the first two observations and fifteen minutes during the last observation. Checking homework took fifteen minutes during the second observation and only five minutes during the third observation. He returned a quiz during the last five minutes of our first observation. During our second and third observations he ended class with a five to ten minute "homework check," which was like a short quiz. The main activity during the first observation was a review, during the second it was working on a worksheet in pairs or trios, and during the third observation the teacher taught a fifteen minute lesson on square roots, a ten minute lesson on using the graphing calculator, and then he gave the students some time to work on their assignment.

The teacher who taught the two sections of Algebra I (Teacher 2) structured the instructional time in different ways on each day we observed. On the day we conducted our first observation checking homework was the first activity. The teacher modeled how to solve problems that the students struggled with as they checked their homework. This task lasted about twenty-five minutes in both classes. Next, we observed twenty-five to fifty minutes of a review activity. During our second observation class started with checking homework again, with at least twenty-five minutes devoted to this activity in both classes. Students spent the remainder of the class period taking a quiz (approximately 45 minutes). Students worked on a set of review worksheets for fifteen to twenty minutes during the beginning of our third observations. This was followed by teacher-led instruction for twenty-five to thirty-five minutes and then an assignment for twenty-five to thirty minutes.

Both Algebra I teachers spent a considerable amount of time engaged in providing individual assistance, monitoring students as they worked on assignments, modeling correct procedures for solving different kind of algebra problems (either when checking homework or introducing new skills), and leading reviews in District C.

Assessment

The participating algebra teachers from District C reported using a wide variety of formal and informal assessment tools and strategies in their classes. These ranged from reading students' body language during a lesson to grading and interpreting chapter tests. The district used the Iowa Tests of Educational Development (ITED) as part of its mandatory assessment process to comply with the requirements of the No Child Left Behind Act.

Both teachers used the time they spent checking homework to informally judge whether students were learning the concepts and skills related to the content for a particular chapter. If students had many questions, then some reteaching or additional examples were given before the class proceeded to new content. If there were only a few questions, then the teachers moved on to the next topic. Both teachers used quizzes, tests, class assignments, and homework completion as a part of their grading procedures.

For this case study, the researchers chose to use grades and ITED test scores as measures of algebra achievement. Although both of these measures are not perfect

indicators of a student's mastery of algebra, they are important yardsticks when it comes to decisions about a student's future coursework and a district's standing with regard to the adequate yearly progress goals set by the state of Iowa.

As far as grades are concerned, one half of the students for whom we had consent earned Fs. Only 23% of the students earned a grade of C or better in District C. None of these students earned an A, and very few students earned Bs or Cs. Students in Teacher 1's class earned slightly better grades than the students in Teacher 2's classes. (See Appendix B for information about grade distributions for the beginning algebra classes in District C.)

We wanted to use an algebra achievement test as our second measure of algebra learning; however, we were unable to find a test that met our requirements. Therefore, we decided to use the ITED tests because these are the measures used for determining mathematics proficiency in Iowa. We begin with a discussion of district proficiency rates. Next, we will address proficiency rates for the beginning algebra students from whom we obtained student and parent consent.

During the 2004-2005 academic year 100% of the 11th grade students in District C were tested in Math. Nearly 70% of these students were deemed proficient in Mathematics. (This means they scored at or above the 41st percentile.) The district's proficiency rate is less than state average of 78.68% for 11th graders in Iowa during the 2004-2006 biennium (Iowa Department of Education School Profiles, 2007). When we examined the proficiency percentages for the 11th grade students with disabilities we found that the rate for the 2004-2005 school year was 25%. This proficiency rate for students with disabilities is lower than state average of 36.53%.

When we examined the mathematics proficiency of the students enrolled in the two algebra classes we observed for this case study for whom we had consent, we found that 71% of Algebra I students (n=21) were deemed proficient. (Teacher 1's students had a 78% proficiency rate, while Teacher 2's students had a 67% proficiency rate.) Comparing the district and algebra class data, we found that students who were enrolled in Algebra 1 had basically the same proficiency rates as typical 11th graders in this district.

Examining Alignment between General and Special Education

It is difficult to address the alignment of the curriculum, instruction, and assessment in beginning algebra classes in District C because there were no special education students enrolled in the classes we observed during the fall of 2004. Therefore, we can only make some limited generalizations about the alignment between general education and special education in these three areas for beginning algebra courses in this district

To address the question of ***curriculum alignment***, we looked at the data from the observations and the document reviews. During this particular semester, there were no

students with disabilities enrolled in the Algebra I classes. Instead, any of the beginning algebra students with disabilities were enrolled in a general education Algebra Topics class with some of their general education peers. The Algebra Topics class met as a "skinny" (45 minute class as opposed to the typical 90 minute class) for the whole academic year and used a different textbook. The person who taught this class elected not to participate in this study; therefore, we did not get to observe what happened and what was taught in this class. Consequently, we cannot make a judgment about the curriculum alignment for this particular semester. In the subsequent semesters when students with disabilities were enrolled in the beginning algebra classes that participated in our project, the curriculum appeared to be the same for students with and without disabilities.

When considering the ***alignment of instruction*** for students with and without disabilities in District C, the main differences would be related to the pace of instruction. Students in the Algebra Topics had shorter periods of instruction and more opportunities for distributed practice because their course stretches across a full school year while the students in Algebra I completed the course in one half of the year. (It is true that both classes have similar amounts of class time; however, the Algebra Topics class had about twice the number of days when students could practice what they had learned with homework assignments.) We do not know if the teacher of the Algebra Topics class used different instructional techniques than those used by the Algebra I teachers.

As far as the ***alignment of assessment*** is concerned, we can only comment on district level assessment. As we noted earlier, the district used the Iowa Tests of Education Development (Grades 9-12) to meet the reporting requirements set forth by the Iowa Department of Education, as well as the United States Department of Education. All of the beginning algebra students took these tests, which means that there was complete alignment between general education and special education when it came to the assessments that yield proficiency percentages that are reported to the public.

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APPENDIX A

Interview Questions for District C Teachers and Administrators: Project AAIMS

All Teachers/General Issues: (45 minutes)

1. Describe how the math curriculum is currently organized at the high school level; what is the general sequence by grade level?
2. When was the text adopted for Algebra? How did this process work? How satisfied are you with the text? Are different texts used for different algebra courses?
3. How do you decide which students enroll in which algebra options?
4. What is the level of satisfaction with student achievement in algebra in District C? In math more generally?
5. Has math been an area of focus in the district in the past few years? Professional development activities? School improvement plans? Strategies?
6. What challenges do students experience in algebra? Are there specific aspects of algebra that present the most difficulty for students?

General Education Teachers: (45 minutes)

1. What do you enjoy most about teaching algebra? What frustrations do you experience?
2. What is your typical teaching routine? Structure for presenting a unit? A lesson?
3. How do you assess student learning in algebra?
4. What are the similarities and differences between students with and without disabilities in general education algebra classes? Are there particular strengths the students with disabilities bring? Particular difficulties they experience?
5. To what extent, if at all, does having students with disabilities in your class impact your teaching?
6. What kinds of information about students with disabilities do you receive from the students' special education teachers?
7. To what extent do you collaborate with special education teachers to meet students' needs? Describe the form this collaboration takes. What barriers do you encounter in your efforts to collaborate?
8. What kinds of teaching strategies/activities do you find are most effective for teaching algebra? Do these differ for students with disabilities? Students in general?
9. What types of support would you like to see provided regarding students with disabilities in your classes? (to you or to the students)
10. Is there any additional information you'd like to have in order to support your instructional decisions? Needs that this project might address?

Special Education Teachers: (30 minutes)

1. What kinds of information about the students with disabilities on your caseload do you provide to the students' general education (algebra) teachers?
2. To what extent do you collaborate with general education teachers to meet students' needs? Describe the form this collaboration takes. What barriers do you encounter?
3. What types of support would you like to see provided regarding students with disabilities in general education algebra classes? (to the teacher or to the students)
4. What are your thoughts regarding the available math course options for students with disabilities?
5. Are there particular difficulties that your students experience when they are enrolled in algebra courses?

Administrators:

1. How does the textbook adoption process work in District C? When was the algebra textbook adopted?
2. What is the level of satisfaction within the district on the level of student achievement in algebra? In math more generally?
3. What is your general sense of the ITEDs data in math? Which grade levels complete ITEDs and ITBS?
4. Has math been an area of focus in the district in the past few years? Professional development activities? School improvement plans? Strategies?
5. What is the process for accessing student cum file data? Demographic information? ITED scores?
6. Are there any questions or concerns that you would like to see the project address during the next few academic years?

APPENDIX B

Distribution of Student Grades by Teacher in District C – Fall 2004

	Algebra I Total n = 21	Algebra I Teacher 1 n = 9	Algebra I Teacher 2 n = 13
A	0%	0%	0%
A-	0%	0%	0%
B+	0%	0%	0%
B	5%	11%	0%
B-	9%	11%	8%
C+	0%	0%	0%
C	9%	11%	8%
C-	5%	0%	8%
D+	14%	22%	8%
D	0%	0%	0%
D-	9%	0%	15%
F	50%	44%	54%

NOTE: Percentages do not add up to 100% due to rounding