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AUTHOR	Mayrowetz, David
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ABSTRACT

This study examined how six teachers in inclusive classrooms who are being encouraged to deliver reform-oriented mathematics instruction modify mathematical tasks and provide academic interventions for students with cognitive disabilities. Qualitative data for this study were collected between April and June 1999 by means of observation and interviews. Two or three mathematics lessons taught by each of the six target teachers were observed. Semi-structured qualitative interviews were also conducted either in person or by telephone within two weeks of the observation. Findings indicated that task modification and the provision of separate assignments to students with disabilities appear to be rare occurrences in inclusive classrooms. Second, larger application and invention tasks seem to be more likely to trigger teacher interventions than the traditional American "drill and kill" problems. However, some of these non-traditional tasks may also be more flexible in accommodating wider ranges in ability. Third, academic interventions can be classified along a dimension of explicitness of the problem-solving strategy and by whether the teacher or student employs that strategy. (Contains 53 references.)

THE INTERACTION OF STANDARDS-BASED REFORM AND INCLUSION IN NEW JERSEY'S FOURTH GRADE CLASSROOMS: ARE THEY PERFECT TOGETHER?

By
David Mayrowetz
Rutgers University, Graduate School of Education

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THE INTERACTION OF STANDARDS-BASED REFORM AND INCLUSION IN NEW JERSEY'S FOURTH GRADE CLASSROOMS: ARE THEY PERFECT TOGETHER?

Reform efforts and policies send strong signals to public school educators telling them how to organize schools and teach students. Educators have a variety of reactions to these messages. They could ignore some while fastidiously implementing others. From a historical perspective though, they are likely to re-interpret them into hybrid combinations of new and old (Tyack & Cuban, 1997; Cohen, 1990). Moreover, policy messages may not be clear. Layering messages one on top of another will likely cause confusion, especially if they suggest contradictory actions.

Two educational reforms, partially motivated by equity concerns, are now everyday realities in many of the nation's elementary schools. The first is the proliferation of curriculum standards and aligned assessments. According to a recent report, 49 states have or are developing academic standards and 39 maintain an assessment system aligned with those standards (Education Week, 1999). Furthermore, while earlier waves of education reform featured multiple choice, minimum basic skill tests for secondary students, today, 34 states have adopted performance-based assessments that are designed to tap higher order thinking skills, even among elementary students (Education Week, 1999). For example in 1997, New Jersey officially initiated the Elementary School Performance Assessment (ESPA), a series of exams which currently tests fourth grade students' attainment of academic standards in language arts, mathematics, public speaking, and science.

The other increasingly popular reform is the inclusion of students with disabilities in general education classrooms. According to data recently released by the US

Education Department, the percentage of students with disabilities who are educated in general education classrooms rose from 32.8 to 44.5% between 1991 and 1995 (Sack, 1998).

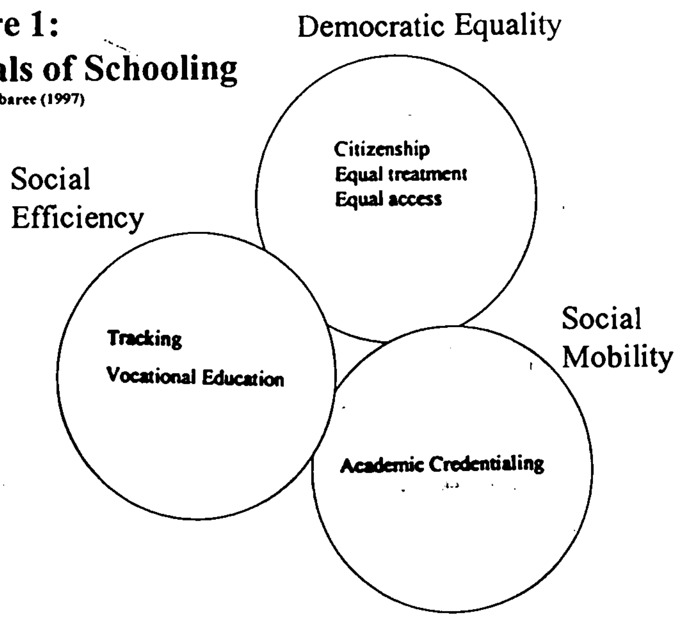
Although many teachers implement these reforms simultaneously in classrooms today, until now little attention has been paid to the consequences of their convergence for teachers and for students (see Knapp, Bamburg, Ferguson & Hill, 1998). This paper takes an initial step in uncovering the complexities of reform convergence at the classroom level. Specifically, I examine how six teachers in inclusive classrooms who are being encouraged to deliver reform-oriented mathematics instruction modify mathematical tasks and provide academic interventions for students with cognitive disabilities.

THEORETICAL RELATIONSHIP BETWEEN "STANDARDS" MATHEMATICS AND INCLUSION

The question of how these two reforms might interact is intriguing. Theoretically, there is reason to believe that standards reform and inclusive education could work together to promote a more equitable education for students with disabilities. However, there also could be an inherent conflict between them. David Labaree's (1997) classifications of educational policies provide an appropriate lens to view this dilemma. Specifically, Labaree suggests that educational reforms often reflect tensions among three general goals of schooling: democratic equality, social efficiency, and social mobility (see Figure 1). The goal of democratic equality represents a desire to prepare students to be socially responsible citizens and participants in the democratic process. In order to fulfill this goal, all students must be afforded equal treatment by schools and equal access to educational opportunity. Of the three goals, this one is most concerned with equity.

Social efficiency refers to the push to train a nation of productive workers. In order to achieve this goal we track our students so they can find jobs commensurate with their intellectual abilities. While these first two goals characterize education as a public good, social mobility treats it as a private one. Reforms that incorporate a concern for social mobility view the educational system as the key to climbing the social hierarchy. Thus, both choice and social justice advocates believe that "educational consumers" can accumulate academic credentials for mobility purposes. In this way, reforms associated with social mobility have been used to promote equity but only for specific students or groups of students who have been historically marginalized.

Figure 1:
3 Goals of Schooling
Based on Labaree (1997)



Interpreting the rhetoric of both standards reform and inclusion, one notes that at this abstract level, they are driven by ideologies that simultaneously compete but also might complement each other. The primary goal driving standards reform is social efficiency, due primarily to the identification of a downward economic plight in the influential A Nation at Risk report (NCEE, 1983). Standards reform garnered national attention a few years later at the 1989 Governors' education summit in Charlottesville, Virginia. Summit participants were told that American students lagged behind their counterparts in the developed world (Miller, 1989 October 4). As a result, a belief emerged that setting national goals, such as "United States students will be first in the world in mathematics and science achievement" (NEGP, 1996), and codifying them in laws, like Goals 2000, would end our "unilateral educational disarmament" (NCEE, 1983) and allow us to be more economically competitive with our Asian and European rivals. This vision was continued when the Clinton administration asserted that standards reform was part of its "human capital agenda" and an effort to confront the "ever-present challenges of international competition and a changing workplace" (Smith & Scoll, 1995, p. 390).

Additionally, influential educational policy researchers posited that fragmentation in U.S. educational governance is perhaps our system's greatest shortcoming. These reform-minded researchers proposed that a lack of coherence among policies resulted in conservative and mediocre curricula and perpetuated an inequitable status quo (Smith & O'Day, 1991). Clear and challenging standards, they claimed, would rally states around a common set of goals and force teachers and administrators to raise expectations for low achieving students (O'Day & Smith, 1993; Oversight hearing, 1992). Students and educators would respond to these greater expectations and the ultimate result would be higher achievement measured by assessments which would simultaneously serve to maintain accountability (NEGP, 1996) and spur instructional reform (Rothman 1995; Popham, 1987). Thus, according to these reformers, standards will not only promote social efficiency but would also lead to democratic equality because *all* students would be exposed to progressive, more challenging curricula that would raise teachers' expectations.

On the other hand, the inclusion of students with disabilities is primarily a reform driven by the goals of democratic equality and social mobility. Inclusionists are most concerned with the rights of and opportunities for students with disabilities. They argue that students with disabilities should be included into general education classes for both academic purposes, such as exposure to more challenging curricula, and for social reasons (i.e., the acquisition of social skills through contact with nondisabled peers) (Baker, Wang & Walberg, 1994/5).

Most researchers recognize the Regular Education Initiative (REI) as the predecessor policy to inclusion (Fuchs & Fuchs, 1994). Although much of the rhetoric associated with the REI dealt with efficient use of school resources (Kauffman, 1989; Will, 1986; Will, 1984), some REI advocates claimed that separating students with disabilities is morally wrong and tantamount to apartheid or slavery (Stainback & Stainback, 1988; Gartner & Lipsky, 1987). With these more radical voices now leading the movement (Fuchs & Fuchs, 1994), inclusion is seen as a way to improve the lives of people with disabilities. For example, Lipsky and Gartner (1996) point to the "limited outcomes" (p. 770) for youngsters with disabilities including high dropout and unemployment rates. Inclusion, they argue will be the means to providing equal educational opportunities for students with disabilities that may, in turn, lead to higher social and economic status for the disabled.

Moreover, inclusionists point to the learning experiences available to all students who interact with students with disabilities. They argue that by arranging social contact and by having students with special needs work with general education students, schools can 'normalize' disability and foster increased respect for difference (Roach, Ascroft & Stamp, 1995). Moreover, they claim that the philosophy of inclusive schooling could serve as a model for a more accepting and egalitarian society (Lipsky & Gartner, 1996). In sum, current versions of inclusion reform are guided by the democratic equality goal but also can be considered to advocate social mobility for students with disabilities.

Based on Labaree's model then, the inherent tensions and harmonies between the two reforms start to come into focus. Not only might some teachers be overwhelmed by the stress and complexity of multiple reforms, but in some ways these change policies might conflict because they are focused on somewhat different goals. However, both reforms incorporate a desire for democratic equality into their rhetoric, perhaps allowing an opportunity for them to blend in ways that would promote more equitable educational experiences for students with disabilities.

Unfortunately, there has been very little research to tease out the specifics of how inclusion and standards would interact in the classroom. The most prominent empirical study in the area to date is an unpublished work conducted by researchers at the University of Maryland. Based on over 170 interviews with administrators, general education and special education teachers in five school districts, McLaughlin, Henderson and Rhim (1997) found that most respondents were "positive" about the possible impact of standards reform on students with disabilities. The overall feeling was that standards would raise expectations for students with special needs and expose them to broader curricula. They found that special educators displayed more of a "wait and see approach"; they feared that students who might not meet standards would be separated and subjected to reteaching. In one school studied, parents responded to rigorous standards by requesting exemptions for their special needs children. McLaughlin and her colleagues (1997) concluded that there is "no definitive answer" about whether the interaction of standards-driven general education reforms and inclusive-oriented special education reforms hurts or helps students with disabilities (p. 51). Similarly, the National Research Council (NRC, 1997) has stated that the two reforms can be reconciled although its members believe that significant adaptation in the delivery of standards-based instruction might be necessary for students with cognitive disabilities.

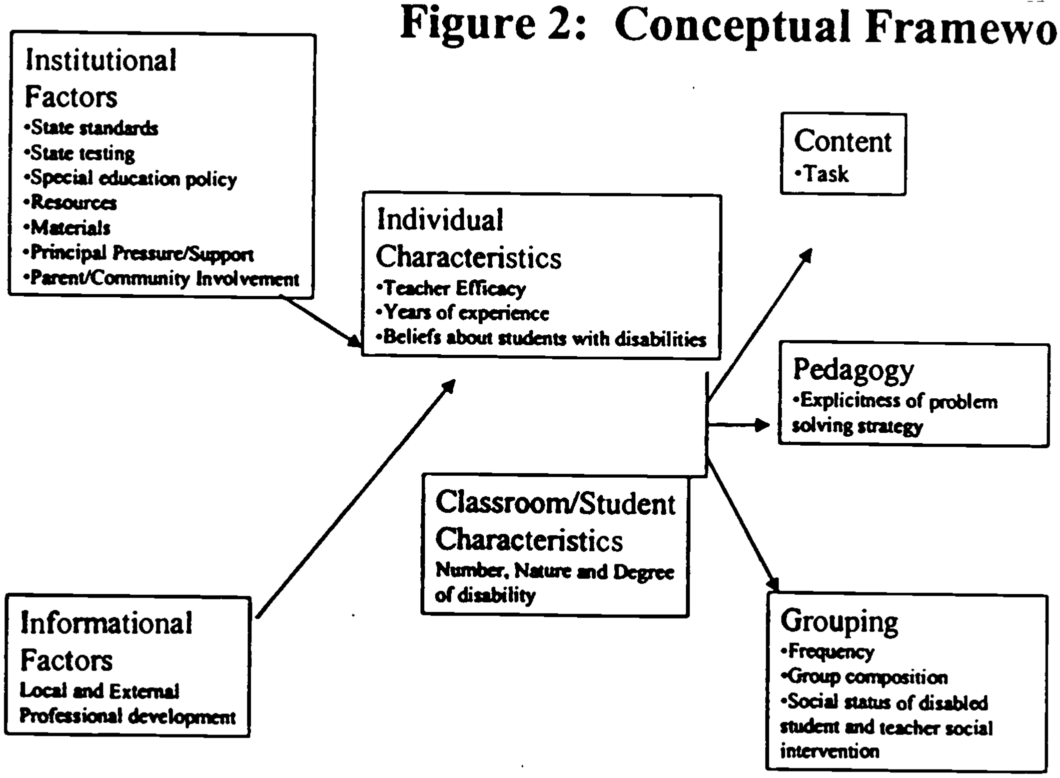
This study goes beyond an analysis of rhetoric and deeper than solely interview data. In line with the recommendations of scholars who study policy implementation (Spillane & Zeuli, 1999), this research explores the patterns and regularities of classroom practice focusing specifically on how teachers are implementing standards reform in inclusive classrooms.

CONCEPTUAL FRAMEWORK

The conceptual framework I used in this investigation was inspired by past research that has attempted to expose the complexities of mathematics instruction and how educational policies designed to affect it are interpreted and implemented (see Cohen & Ball, 1990a). According to these authors, the effects of policies "depend on what teachers make of them" (Cohen & Ball, 1990b, p. 233). In other words, policy can be enacted in several different ways leading to a multitude of classroom practices by teachers who all say they are influenced by the same policy. This logic is akin to the "street level bureaucrat" theory which states that individuals entrusted with implementation of policy can expand, subvert, or otherwise alter policy intent in order to apply it practically (Weatherly & Lipsky, 1977).

The following literature-based model (Figure 2) displays how an assortment of relevant concepts could relate to each other. The concepts on the right represent key classroom practices where the reform messages are likely to meet and impact the provision of equitable educational experiences. On the left are contextual factors (institutional and informational) that are interpreted through the unique outlooks of teachers (individual characteristics). In tandem with classroom/student characteristics, these contextual factors influence classroom practices.

Figure 2: Conceptual Framework



In this paper, I limit the scope of investigation to two classroom practices, modifications of task and academic interventions for problem solving.

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Tasks

A primary reason for selecting mathematics instruction as the focus of this study is that among all the subjects taught in elementary schools, there is the greatest consensus about what constitutes a good and appropriate mathematics curriculum (notwithstanding California's "Math Wars" [see Loveless, 1997]). The National Council of Teachers of Mathematics (NCTM) put forth the first set of national subject-specific standards in 1989 and most states, including New Jersey (Joftus and Berman, 1998), have adopted the NCTM's vision of mathematics instruction in their standards (NJSDE, 1996) and curriculum framework (e.g., Rosenstein, Caldwell & Crown 1996). In turn, the ESPA is aligned with the standards and curriculum framework.

Both the NCTM and New Jersey Core Curriculum Content standards are designed to increase the academic difficulty level for students and broaden the curriculum in elementary schools. Standards advocates highlight the need to expose children to *challenging* curricular content in the hopes of raising teachers' expectations (Smith & O'Day, 1991). In a subsequent piece, these authors say that all but the 2-4% of school children who are severely disabled should be included in the standards reform (O'Day & Smith, 1993). Also, the authors of the national and state mathematics standards stress the importance of including historically ignored topics into elementary classrooms such as probability, statistics and even the rudiments of calculus (NCTM, 1989; NJSDE, 1996). Thus, from a standards-reform perspective, equitable instructional practice for students with disabilities with regard to content could mean equal access to challenging tasks in a broad curriculum.

While some critics of the NCTM standards point out that students with disabilities are not explicitly referenced in the document (Rivera, 1997; Miller & Mercer, 1992), of greater concern is that tasks in standards-oriented math instruction could be too difficult for at least some youngsters with cognitive disabilities. As a result, the National Research Council recommended that when standards are implemented, academic tasks need to be modified so that all students will be able to benefit from them (NRC, 1997). Thus, most researchers from the special education literature fear that expecting included students to perform certain tasks might harm, not benefit them. But how tasks are altered or how students are accommodated in the classroom could affect the mathematical challenge within the task, the opportunities to construct knowledge, or even the classroom dynamics.

Since task serves as a flashpoint between the two reforms, it is important to classify them so that differences can be explored. Based on their review of videotapes from the Third International Mathematics and Science Study (TIMSS), Stigler & Hiebert (1997) separate student activities into three major categories. The first is practice in which students repeat the same mathematical activity several times usually in the hope that repetition will lead to learning. The second is application where students are forced to take previously learned information and employ it in a new mathematical context. For example, if students already know that the area of a rectangle is base times height, by bisecting that rectangle, a teacher may guide her students to an understanding that the area of a triangle is ½ (b x h). Finally, students may be asked to invent procedures or mathematical theorems to solve problems. While this is a common practice in Japan, it is very rare in the US.

Another way to classify a mathematics task is by looking at whether they require principled (conceptual) or procedural knowledge (Spillane & Zeuli, 1999). Tasks that require procedural knowledge often have students follow predetermined steps to complete a problem. Tasks that call on students to use a higher level of reasoning force students to develop principled knowledge of underlying mathematical concepts. Finally, one can examine task size. While short problems tend to be fairly straightforward, such as one step algorithms or the identification of 3-Dimensional (a.k.a. space) figures, larger problems often—though not always—present an opportunity for student exploration of mathematical patterns or concepts (Firestone, Mayrowetz & Fairman, 1998). Examples of larger tasks include devising surveys and analyzing responses via display and long division problems.

Explicitness in academic interventions

A guiding principle of the NCTM and the New Jersey Core Content Standards, is that an over-reliance on traditional pedagogical techniques such as repetition until automaticity is insufficient to achieve a deep, conceptual understanding of mathematics. Greatly influenced by a new understanding of cognition and learning, the authors of the NCTM standards believe that a constructivist teaching approach can lead to greater mathematical "power" for students. According to constructivist theory:

- Mathematical knowledge is actively constructed by the child.
- Children create new mathematical meaning by reflecting on their physical and mental activity.
- Children create their own individual interpretations of mathematics. (Wood, Cobb & Yackel, 1992)

Thus, constructivist teachers allow students to create mathematical understanding by explaining and justifying their unique mathematical models to others.

In line with the constructivist paradigm, the NCTM (1991, p. 3) calls for the following shifts in emphasis regarding mathematics instruction:

- away from "mechanistic answer finding" and toward problem solving,
- away from the teacher's sole authority over the correct procedures and answers, and toward student verification through mathematical reasoning, and
- away from a view of mathematics as isolated concepts and procedures and toward a development of connections among mathematical ideas and between mathematics and the real world.

Of particular interest for this paper, standards reform mathematics instruction has teachers encourage students to develop their own mathematical models. According to one constructivist teacher, the teacher's role is to assign problems but not to explain the answers (Lampert, 1990). Instead, the expectation is for students to justify their mathematical assumptions and strategies to each other and to her. Specifically, she writes, "the students' responsibility is figuring out how to solve the problem as well as finding the solution" (Lampert, 1990, p. 40). In essence, constructivist teachers are facilitators of student knowledge acquisition, not "tellers" of mathematical fact or procedure (Stigler & Hiebert, 1997). Self-directed students are expected to develop their own strategies for problem solving.

Concurrently, almost all researchers studying children with learning disabilities (LD) for example, agree that accommodations and interventions are needed in order to provide these students with an appropriate and meaningful education (NRC, 1997; Cawley, Baker-Kroczynski & Urban, 1992). The question, though, is how much and what types of accommodations are necessary.

Most researchers in the LD field believe that intense and individualized instruction is critical to academic success (NRC, 1997; Fuchs & Fuchs, 1994). Others believe that whole class accommodations, such as teaching to different learning styles

(Thorton, Langrall & Jones, 1997), teaching specific reading strategies, and redesigning tests, are seen as sufficient. Popular among those who study mathematics disabilities is the instructional strategy known as "scaffolding." Scaffolding is the process of demonstrating and modeling explicit problem solving strategies to students and then slowly removing those supports (the scaffolding) as students use those strategies independently (Miller & Mercer, 1997). This approach may be especially important because many students with learning disabilities are not necessarily self-directed learners due to academic frustration or failure (Mallory & New, 1994). Similarly, some authors suggest giving a "just right" level of specification in their problem solving instructions, that is, they should not be so vague that they do not help the student but not so narrow that they become a rote sequence for solving similar problems (Carnine, 1997).

METHODOLOGY

Because the conceptual framework connects classroom practices and several contextual factors outside the classroom, a combination of qualitative and survey research techniques provided an appropriate methodological route. Since the findings in this paper relate only to classroom practice, I will focus my attention on the data collection and analysis procedures in the qualitative aspects of this research. Qualitative research methods proved sufficiently flexible to examine the understudied phenomenon of how instruction consistent with standards were being delivered to included students with disabilities (Patton, 1990). Specifically, observations of classroom practice are critically important so that researchers can delve beneath the surface changes that many assessment driven reforms accomplish (Spillane & Jennings, 1997; Firestone, et. al., 1998). Also, self-report of instructional practice and beliefs can be affected by the social desirability of certain responses.

Sampling

This study is being conducted simultaneously with a larger study focusing on the effects of a relatively new elementary school test (the ESPA). A statewide representative sample of 247 New Jersey fourth grade teachers is participating in that study. The six teachers described in this paper were selected from the larger sample of based on two criteria. First, these teachers reported teaching mathematics to students classified as disabled, specifically with a cognitive disability such as a learning disability (LD) or neurological impairment (NI). Second, their responses to 30 questions on instructional practice suggested that these teachers were teaching mathematics in a manner consistent with New Jersey's standards. Table 1 summarizes some of the key characteristics of the six teachers and their classrooms.

TABLE 1: Teacher and Class Characteristics

	Years of teaching Experience	Previous experience teaching math to students with disabilities	Class Size	Number of students with cognitive disabilities in math class	Number of additional students that the teacher believes have cognitive disabilities	In Class support	Rank* of teacher based on responses to math pedagogy questions (out of 247)
T1	31	Yes	23	2	2	Yes	9th
T2	2.5 years	No	18	7 & 1 with ADD	1	No	7th
T3	3 years	No	22	1	1	No	T19th
T4	6 years	Yes	18	1	0	No	56th
T5	1 year	No	24	1	0	Yes	6th
T6	3 years	No	23	1	0	No	T19th

*Rank is out of 247 teachers statewide.

This sampling design skews the population of teachers in my study in order to increase the likelihood of encountering teachers who engage in mathematics instruction similar to that implied by the standards. This ideal-typical case selection approach (LeCompte & Priessle, 1993) is necessary because previous studies (Firestone, et. al., 1998; McDonnell & Choisser, 1997) have shown that a very small minority of teachers are teaching in a manner consistent with the NCTM standards. Essentially, the sampling strategy reflects an attempt to find key outlier teachers who are interpreting, through practice, both standards and inclusion.

Data Collection

Qualitative data for this study were collected between April and June, 1999 through observation and interview. Two or three mathematics lessons taught by each of the six target teachers were observed. Notes were taken on a laptop computer with an attempt to record teachers' and students' comments verbatim, to the greatest extent possible. The observer focused on:

- the teacher's instructional style viz. all students and the student with a learning disability, including explication of problem solving strategies and attempts at making connections among mathematical concepts and to real world application.
- the nature and complexity of mathematical tasks for all students and the students with disabilities.
- any specific accommodations or modifications of work for the student with a disabilities.
- the teacher's grouping techniques, the social status of the student with a disability in his/her group, teacher interventions to ensure active participation for the LD student, and the level of discourse in the group.

Fieldnotes were cleaned soon after the observations were conducted, usually on the same day.

Semi-structured qualitative interviews (Patton, 1990) were also conducted either in person or by telephone within two weeks of the observation. The teachers were asked about their grouping and testing practices, support and collegiality in their school/district, their perceptions of students' disabilities, and what accommodations or modifications they feel they must make for these students. These interviews were tape recorded and transcribed or notes were taken on-site and entered into the computer within 24 hours.

Data analysis

The qualitative data were analyzed using two compatible approaches. First, the researcher filled out an eight-page post-observation protocol about each lesson. Completing each protocol forced the researcher to describe a variety of aspects of the lesson and tasks within the lesson including the content taught, instructional strategies (e.g,, explicitness of teacher direction, use of multiple media, complexity of tasks) and classroom and within-group discourse. After all the protocols were completed, I constructed tables to search for regularities and differences among the teachers. Descriptions of each assigned task were tabulated and compared as well.

Second, the observation and interview were entered into a qualitative data analysis package. Responses to interview questions were coded and compared to illuminate differences regarding beliefs about instruction and the school/district context. A handful of observations were also coded using the open and axial coding techniques recommended by Strauss & Corbin (1990). These procedures allowed me to both deductive apply and inductive create typologies for describing how and when teachers modified instructional tasks for students and how they provided academic interventions.

RESULTS

In this section, I present two anecdotes from my field experiences that exemplify differences in task modification and academic interventions. Then, I will describe some of the patterns and types of modifications and interventions I observed.

Lesson One: Data Display taught by Teacher 1

Of all 39 observed, this lesson contained one of only two large tasks which required students to apply previously acquired information into a new situation and then asked them to think about it on a conceptual level. The mathematics instruction began as 22 of 23 students in this wealthy district left their desks and assembled in a large circle on the rug and started to discuss their field trip to a museum of Native American history, art and culture. One student with a disability, Paul[1], remained at his desk with his child-specific aide. Another classified student and two whom the teacher wanted classified sat with their peers. None of these children had visible disabilities. The teacher initiated a half hour class discussion that flowed from the field trip to a museum to practical reasons for collecting and organizing data. The teacher's questions, at times slightly awkward, did get the students, all students, talking to each other about data. She asked them, "How do you think they [museum curators] kept track of everything they had?" and "How do you think the scientists knew everything they had?" When a few student responses were off-target, the teacher decided to redirect the discussion to a real life situation with which the students were more familiar, their school. "How do you think [the principal] knows how many students are in the school?" Suddenly, student responses were more appropriate. "She counts them." "Maybe she writes it on a piece of paper." "Inventory." Just as the conversation was about to wind down, Teacher 1 stopped the class and asked a student she believes to be learning disabled to separate himself from his friend, the other unclassified student. The boy stood up, walked across the room and sat next to the aide, who seemed to whisper something reassuring in his ear.

After a 45 minute interruption for physical education, the fourth graders returned to conduct a hands-on activity applying some of the ideas they discussed earlier. The teacher led the students, now at their desks, in an exercise in which they estimated the number of raisins in a small box and then the teacher recorded those estimates with tally marks on the blackboard. The process of counting and gathering these data was long and the students would occasionally grow loud and restless. While encouraging students to reconsider their estimates, one of the unclassified students asked the teacher, "Why do they have grapes on the front [of the box]?" This question prompted a surprising amount of hostility in the teacher who stared him in the eyes, 6 inches away from his student's face and whispered angrily "Raisins are dried grapes. Follow what we're doing. Forget about the grapes." Class continued as students counted the actual number of raisins in each box and a student recorded those numbers on the blackboard. After that, the teacher assigned the students the following tasks, "One, think of a way to present this in an organized fashion. Two, fill in the data into your organized way. And the third thing is to think of 3 things, 3 conclusions, that your data shows [sic]."

Soon after she announced the three part assignment to the class, she went almost immediately over to where two unclassified students were sitting. She asked, "How are you going to show your data?" and before they could answer, she tossed two rubber toys off their desks and continued:

[1] All names in this paper are pseudonyms.

"Put these guys away. How are you going to make it? Highest to lowest? A graph? How are you getting started? Did you find listing them from lowest to highest helpful?"

Students in the class used four different methods for organizing their data. One popular method was a box plot where students would put the number of raisins per box along the X-axis and then use X-marks up the Y-axis to represent a student with that total. Others made a line plot using the same axes but marking coordinate points in the quadrant (instead of building bars) and connecting them with a line. During the exercise, the teacher commented to me about the disparity in the quality of work between a few students that she considered gifted and those that she thought should be classified. My own examination of the student work did show marked differences in the accuracy and neatness of the data displays.

Lesson Two: Area and Perimeter worksheet questions taught by Teacher 4

The modified task, photocopied from a workbook that that accompanied the mathematics textbook, required that students provide information about rooms on a simple blueprint. Students answered 8 questions in approximately 20-25 minutes of partner work. Most of the questions called on students to provide the area and perimeters of rooms or the length of the wall of one particular room. These were short tasks in which students practiced their procedural knowledge. There were a few questions however, which required students to make several calculations in order to give an answer. Examples of such "large" problems included items about which rooms have equal perimeters, which have equal areas, and how many times greater the area of one room was over another.

Teacher 4 introduced the task to her class, which included Lisa, a girl with moderate neurological disability (according to the teacher) and a hearing aide. She began with the following speech:

> Use the area and perimeter to solve each problem. The map below shows the Astronomy section of the Science Center. So you'll be finding the perimeter and area of rooms in the Astronomy center like the Planet room and the Galaxies room. You are going to work with a buddy. I want you to work *with* your buddy. Do as much math as you can on the paper. When you feel confident, check work with your calculator only. I do not want you to solve the problems with your calculator. If you are feeling comfortable with area and perimeter and your partner is feeling good about it, then you can move to the calculator. [emphasis as spoken]

All of the students paired up and began working on the assignment. Very quietly, Lisa and her partner started punching numbers into their calculators trying to determine the perimeter of the entire floor of rooms. The teacher came over as she was checking on the progress of each pair. As the teacher asked them if they were using the calculator to confirm their answer, she noticed that Lisa was having difficulty pressing the buttons. She interjected, "Try laying it flat on your desk and using the tip of your pencil to punch the numbers," but Lisa was still unsuccessful. The teacher then asked the partner to perform the calculations so that Lisa could see how to do it. As the partner started to explain, the teacher walked away. A few minutes later, the teacher returned. "How did you do on the calculator?" she asked. Neither girl responded and the teacher walked away again. The second question required that the student find the area of the entire floor. Lisa started this dialogue with her classmate,

> Lisa: What's the area mean?"
> Partner: The around...(trailing off)
> Lisa tries to measure the area with a ruler.
> Partner: Area is square units.
> Partner raises her hand, looking for the teacher who is across the room discussing the work with other children and looking over their shoulders.

Lisa: I don't get that.

It took about five minutes for the teacher to see the raised hand but once she did, she quickly came over. The partner whined that she could not explain the concept of area to Lisa. The teacher turned to Lisa and said:

> What are you working on? What's the area of the floor? Area is what's inside here, the amount of space. You are going to use the measurements given to you. You don't need a ruler for this. To find the area of the floor you do something faster than adding. How would you find the area of the Comets room [the top right rectangle]? Remember, area equals length times width? Pretend all you see is the Comets room. [The teacher covers the rest of the blueprint with another piece of paper].

As Lisa looked at the Comets room on the paper, Teacher 4 called on her partner to model the procedure of multiplying length times width. "Help her out," she urged the other girl, "How would you find the area of the Comets room?" But before the partner could respond, the teacher told the girls, "Why don't you find the area of each room. Instead of answering these questions, just do that." Although the girls would have to take this step before answering some of the more involved problems, the teacher obviously thought that Lisa would not be able to complete the entire worksheet with her peer. Thus, she scaled back the assignment eliminating the large procedural tasks in favor of smaller ones.

A few minutes later, after Lisa stepped out of the classroom for a few minutes, the teacher came over to her partner and said, "You're doing well. Just show her the way. I know you know what you're doing." Shortly thereafter, the lesson ended before the girls had finished their reduced assignment.

Modification of mathematical tasks.

Researchers from multiple methodologies have shown that typical mathematics instruction is intellectually shallow and often requires that students engage in short practice-type tasks, such as the rote memorization of mathematical facts (Stigler & Hiebert, 1997; Firestone, et. al., 1998). Previous studies have shown that even in cases where teachers report to be teaching in ways congruent with ambitious reforms such as the NCTM standards, many of their lessons are still characterized by these unambitious tasks (Spillane & Zeuli, 1999). Therefore it is not surprising that of the 39 tasks observed in 15 classroom observations, slightly over half (20) were small and called on students to practice procedural knowledge.

However, among those tasks that broke the modal pattern, an important distinction can be drawn, one that is best displayed in a comparison of the tasks in lessons one and two. The student work in Lesson One was demanding and drew on the earlier discussion on the importance of keeping data manageable and accurate. When students devised their own methods of displaying data, the task itself was sufficiently flexible for all students to complete with differing levels of skill. The teacher commented in our interview:

> "We are doing our original gathering of math data right now and for my Paul and my [students who should be classified as special education], it's like, let's get real basic, let's just get something down. Yet for the other end of the spectrum, I really expect you to…in fact [a student perceived to be gifted] when he was interpreting his data, he was able to change all of his results into fractions. So I would expect him to do that. So that's how I differentiate, all within the same assignment."

The task in Lesson Two was a large one for students to practice procedure and there was more than one way to complete that task as well. For example, in the problem that Lisa and her partner had so much difficulty with, they could have added the sides of the rectangular floor on the blueprint (as they did to find the perimeter), multiplied, and found the area. On the other hand, they could have calculated the area of each room and added those products together. The latter approach would have paid dividends later since subsequent questions required that students compare the areas of different rooms.

But the flexibility for students in this task is much less than that contained in Lesson One. Students in the first lesson could have used, as Teacher 1 put it, "lists, charts, or graphs." Indeed, there was some variety in the type and quality of data displays in that class. There was also a range in the sophistication of conclusions that the students drew from their displays. In Lesson Two, the student choices were constrained to multiplying one set of numbers or multiplying another, using the same formula. Additionally, the end result would be one correct answer. The teacher made the decision to scale down the larger procedural tasks into smaller ones that she thought were more feasible for Lisa and her partner. In so doing, she forced them into the second approach for solving the problem (even though they didn't complete the problem or the worksheet that day).

But one reason that the teacher in Lesson Two might have modified the task in that manner is that smaller procedural tasks do not appear to require the interventions that others do. As noted earlier, 20 of the 39 tasks observed were typical American style, (i.e., short, practice of procedural knowledge). In 14 of those 20, teachers did nothing different or special for students with disabilities. In contrast, teachers intervened in some fashion in 17 of the 19 remaining tasks.

Task modification was not a common occurrence in the field. In fact, Lesson Two featured the only task I observed that was modified for a student with a disability.

Also rare was the separation of a disabled student from the class to work on a different task. Of twenty students with disabilities (or believed to have disabilities) in six classrooms, only one disabled student, Paul, was ever provided with instruction wholly separate from his peers. Specifically, during another lesson on organizing and displaying data, Paul and his aide left the classroom to practice their multiplication tables and finding common denominators. It is likely that separate instruction was more feasible with Paul since he was assigned a child-specific aide in his Individual Educational Plan (IEP).

In sum, which tasks are modified and how they are altered are questions that deserve further study. This preliminary analysis suggests that at least some larger, application tasks that require the use of some conceptual knowledge may be more able to accommodate students with cognitive disabilities. Furthermore, if tasks are modified, teachers may change them to smaller procedurally-oriented tasks since they are simpler and frequently do not require interventions.

Explicitness in teacher's academic interventions

During our interviews, the six target teachers generally downplayed the changes they made in their math instruction because of the presence of classified students. Most stated that alterations, if any, were minimal or involved testing situations. For example, two teachers mentioned that they attempt to limit the amount of writing on tests for some students either by cutting down the number of open-ended response questions for that student or by allowing the classified student to use a computer to construct a response. Another said that she sits with her included student to explain and/or rephrase test items so that she can better understand them. Also, two of the six teachers said that they are proceeding more slowly through the curriculum. The following response by Teacher 4 displayed the typical attitude:

> Maybe I repeat things a little more than I would have. Maybe I work a little slower than I would have. But nothing really stands out. Nothing that I can really acknowledge.

Classroom observation revealed a consistent but more complex picture of accommodations and interventions in the classroom. One such "unacknowledged" change was academic intervention into the work of students with disabilities. I define a mathematical academic intervention as an act in which the teacher guides a student toward the solution of a problem or the development of a problem solving strategy. Teachers provided academic interventions in 16 tasks of 39 tasks.

Academic interventions differ on two dimensions. First, interventions will vary on the degree of explicitness in problem solving strategy. For purposes of this paper, I will characterize this dimension as a simple dichotomy of implicit vs. explicit. Second, the problem solving strategy can be employed either by the teacher, with the student being the passive participant, or by the student him/herself. The result is the following two by two matrix:

	Individual implementing the strategy	
Problem solving strategy	Teacher	Student
Explicit		
Implicit		

Consider the academic interventions in Lessons One and Two. In both cases, the teacher meandered over to their special needs students fairly quickly after giving the assignment. The teacher of Lesson One used leading questions that suggested strategies for these students. These questions, namely, "How are you going to make it? Highest to lowest [a list]? A graph?" were strikingly different from the open-ended questions she asked the class during their earlier discussion on collecting data. Essentially, Teacher 1's intervention is similar to that employed by Teacher 4 with Lisa. Both contained specific directions of how to solve the problem. Teacher 4 asked Lisa, "To find the area of the floor you do something faster than adding...Remember, area equals length times width?" The are two differences between the interventions. The first involved the nature of the task. The formula was the sole strategy expected to be employed to solve this problem while the task in Lesson One allowed for multiple methods. Second, the students in Lesson One needed a push to get them started while Lisa could not recall what area meant, conceptually. Nonetheless, both are examples of what could be called explicit-teacher interventions.

A simple example of the explicit-teacher intervention was observed when Teacher 2 conducted a lesson on identifying parts of 3-Dimensional figures. One learning disabled student could not remember what the intersection of 2 faces was called, Teacher 2 encouraged him to look in his self-made geometry dictionary (all students had one). The student did so and recalled the term is "edge." All three of these interventions would belong in the explicit-student quadrant since the teacher explicitly mentioned the strategy and student implemented it.

Implicit-teacher interventions were observed as well. In one lesson, Teacher 3 believed that her included student, Lola, incorrectly answered a worksheet question about number of faces in a rectangular prism that are rectangles. Lola answered 6 when the teacher (and teacher's edition) believed the answer 4. The other two faces are squares, of course, which are rectangles too. Nonetheless, Teacher 3 picked up the prism that Lola had just built from straws and pipe cleaners and began a line of curt questioning so that the student could remedy the perceived error.

> Teacher 3 (to Lola): Can you show me the four faces that are rectangles?
> Lola points around the prism.
> Teacher 3: What's this one? [Teacher 3 points to a square] Is it a rectangle?
> Lola: All are equal.
> Teacher 3: So what does that mean?
> Lola: A square.
> Teacher 3 nods and walks away.

In this instance, Teacher 3 never told Lola that her answer was wrong or explained to her specifically how to correct it. Instead, she modeled the steps and reasoning behind solving this simple procedural problem. However, Lola was just "along for the ride" as the teacher essentially appropriated the task from her by asking the leading questions, despite the fact that Lola had to take the final step of changing her answer from 6 to 4 rectangular faces.

Teacher 3 used explicit-teacher interventions even more frequently than implicit-teacher ones. In this recitation session, Teacher 3 did not ask any questions as she corrected Lola's attempt to follow the worksheet directions for recreating a footpath on a grid.

> Teacher 3: Where did you go from?...Here! [Teacher points to the page.]
> Lola: Quarter turn clockwise yeah, yeah.
> Teacher 3: You should have gone that way.
> Lola: But here next, it says...
> Teacher 3: Now it says walk 2 steps, you have to go up here?
> Lola: Oh , OK.

Clearly, she explicitly showed Lola the correct answer to the problem by explaining how to complete the puzzle and how the student erred. Moreover, it was the teacher not, the student who employed the strategy

Notably, I did not witness any instances of an academic intervention that was implicit and led to student performance of the task. However, one could imagine various ways that such interventions could be accomplished. A teacher might ask a leading question or two to spur the student into making connections with previously learned material or suggesting analogous situations more closely aligned with the student's interests and experiences. Such questions could include "How is this problem similar to the area of a circle problems we did last week? How is it different?" or "Pretend the owner of the New York Yankees is angry because his team made too many fielding errors in the playoffs. He is angry and wants to fire poor defensive players. He also wants to make the decision for himself. You know the number of errors each player made. How would you display the information to him on the blackboard?" These interventions would certainly require quick thinking by the teacher and could take a significantly greater period of time to employ than the other 3 types.

CONCLUSIONS

This attempt at making sense of classroom practice in inclusive fourth grade mathematics classes is admittedly rough and far from conclusive. The sample size of teachers is not only unrepresentative but also the number of observations and tasks are too small to call these findings anything more than illustrative. However, as data collection and analysis continue in this research project, a few important lessons stand out. First, task modification and the provision of separate assignments to students with disabilities appears to be a rare occurrence in inclusive classrooms. Second, larger application and invention tasks seem to be more likely to trigger teacher interventions than the traditional American "drill and kill" problems. However, some of these non-traditional tasks may also be more flexible in accommodating wider ranges in ability. Third, academic interventions can be classified along a dimension of explicitness of the problem solving strategy and by whether the teacher or students employs that strategy.

Additionally, these findings suggest further analyses that would add more greater breadth and relevance to this study. Social status and the teacher's treatment of students with disabilities deserve more attention. Clearly, Teacher 1 directed strong anger at one of her unclassified students. She informed me that as the school year drew to a close, the entire class was losing their patience with him. Teacher 4 also took steps students that affected Lisa's social status in the classroom. Teacher 4's comments to Lisa's partner imply that she understood the challenge of working with Lisa and felt the need to bolster the partner's confidence. This teacher also said that she felt she had to model appropriate behavior and patience when working Lisa in order to "strengthen the demeanor" of the class. These data also suggest that visibility of the student's disability should be considered as a possible predictive variable for social status and teacher actions that enhance or diminish it.

Another concept that merits exploration is the teachers' ownership of students with disabilities. The students who participate in these mathematics classes are not all fully included. Several of them learn language arts or other subjects from a certified special education teacher and as a result, the teacher-included student relationship could be weaker than with other students. Similarly, classroom aides, especially if they are child-specific aides, may decrease the responsibility that a teacher feels for teaching, modifying, or intervening in those students' mathematics education. The district or school's inclusion practices, such as the provision of support or the prevalence of resource room instruction, may in turn affect ownership.

Finally, all of the instances of modifications and interventions should be compiled using the teacher, not the task, as the unit of analysis. Then, these data can be compared to teachers' survey responses to find whether contextual variables such as principal pressure/support, parent-community involvement, collaboration among teachers and professional development experiences are associated with classroom practices.

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