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Reshaping Perspectives on Teaching Mathematics in Diverse Urban Schools

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In decades past, we have witnessed increased attention given to education in urban school settings—an environment that includes students who are from low socioeconomic families and exhibit diverse learning styles. The authors recognize that not all students in these settings are African Americans and, conversely, that not all African American students are urban students. Urban students vary in ethnicity; African American urban students, however, will be the focus of this article.

Urban education is defined to be the process that enables students attending schools in urban areas to receive their education. The key word is *process;* it infers a set of actions or changes occurring in some special order. Given this interpretation and the need to create an opportunity for all students to learn mathematics, we will address three fundamental questions: (1) What are current perspectives on teaching in diverse urban schools? (2) What kinds of actions and changes should occur in order to enhance mathematics instruction in urban school settings? and (3) What existing exemplars will help reshape and advance our thinking of teaching mathematics in diverse urban school settings?

Current Perspectives on Teaching in Urban Schools

Description of Schools and Students

It is known that urban schools are often affected by the same forces affecting the areas in which the schools are located—high rates of crime, infant mortality, teenage pregnancy, and substance abuse. As a consequence

of these forces, urban schools tend to operate in a different climate from other schools.

Students attending urban schools are frequently labeled "at risk of failure," "economically disadvantaged," or "unteachable/unreachable." Such labels lead one to believe that students attending urban schools *cannot* achieve the same academic levels as other students. If teachers in particular embrace this attitude about teaching in an urban setting, then the learning environment becomes very restrictive and limiting. Conversely, if teachers embrace the notion that urban school students can achieve and learn, then the focus of schooling becomes the *means* of instruction, instead of instructional *outcomes.*

Means and Outcomes

The question is not whether urban school students can or cannot achieve mathematical skills; rather, it is which *means* will elicit maximum success in mathematics. Gilbert and Gay (1985, p. 133) assert that "the key to improving success in school for poor black students is modifying the means used to achieve learning outcomes, not changing the intended outcomes themselves." Thus, mathematics teachers in urban classrooms should develop and implement teaching strategies that will enhance their students' learning capabilities, dispelling the myth that urban school students are at risk of failure.

There is a tendency to avoid instructional methods requiring urban students to use higher-order and critical-thinking skills. Literature indicates that urban students often receive "less instruction in higher-order skills than other students, and are given a curriculum that is less challenging and more repetitive. Teachers in those classes are more directive, breaking each task down into smaller pieces, walking them [the students] through step-by-step, and so leaving students little opportunity to exercise higher-order thinking skills" (McGrath 1994, p. 26). We often find urban students in mathematics classrooms that focus primarily on recall and comprehension; they are seldom given opportunities to advance to synthesis and evaluation (Bloom 1956).

Summary

Varied perceptions exist about students attending urban schools and about teaching in an urban school. Certain perceptions have detrimental effects on all stakeholders in the schooling process—students, parents, teachers, and administrators alike. Mathematics is a discipline in which urban school students historically have exhibited lowered performance (Mullis et al. 1993). The authors contend that it is essential for those urban school mathematics teachers who hold limiting perspectives to examine their perceptions and then create classroom environments that will enhance mathematics instruction.

ENHANCING MATHEMATICS INSTRUCTION IN URBAN SCHOOL SETTINGS

Instructional Process

Instructional delivery is the result of a process that begins with examining one's own value system. According to Nel (1992, pp. 38–40), "teachers' thinking, knowledge, perceptions, and beliefs could be a major contributing factor in the empowerment or the disabling of minority students.... Research literature shows a high correlation between successful academic performance of minority students and educators' sensitivity (attitudes and beliefs), knowledge of cultures, and application of cultural information." The results of her study indicate that cultural sensitivity plays an integral role in the learning process. Teachers with a heightened level of cultural sensitivity realized a need to promote instruction that would actively involve minority students.

In earlier years, Gilbert and Gay (1985, p. 134) recognized that instruction is a behavioral process and noted that "teaching and learning are sociocultural processes that take place within given social systems." Generally speaking, however, teaching and learning are two interdependent processes. That is, as the literature on social learning theory suggests (Bandura 1975), the social context of learning may affect the academic success (i.e., the learning) of students in urban schools. Because children learn behavior patterns from adult models, the presence of teachers and administrators who have special preparation in urban education could provide assistance in eliminating certain difficulties urban school students often experience.

Instructional Strategies

The means for teaching students in urban schools may differ from the means for teaching other students (Gilbert and Gay 1985). Callahan (1994, p. 124) suggests that cooperative learning groups, the use of technology, supervised practice, and good questioning techniques are among the teaching strategies that may be implemented to help urban students "bridge the gaps of cultural and mathematical difference." Strategies that de-emphasize the traditional lecture and emphasize hands-on mathematics exercises and activities have been found effective for urban students (Beckum, Zimny, and Fox 1989), and furthermore, "flexibility and experimentation were [and are] viewed as superior to reliance upon formulaic and static instructional strategies" (p. 438).

Let us examine more closely two components: supervised practice and good questioning techniques. Collins (1992) submits that the purpose of practice is for students to reinforce their mental constructions. Supervised practice extends this purpose by encompassing individual assistance and allowing for expressions of praise and encouragement (Callahan 1994). The following scenario depicts a demonstration of supervised practice in an urban mathematics classroom (all names are pseudonyms):

A teacher and two or three students, all sitting close together, are reviewing the process for dividing whole numbers using base-ten models. After one student successfully completes a problem, the teacher remarks, "Good work, LaTonya! I want you to share your solution with the others." The other two students appear to have some difficulty with the process. Recognizing this, the teacher says to them, "It looks like you're off to a good start. What is your next step?" If constructive criticism is needed, then the teacher could say, "Reggie, I'm not sure how you arrived at your answer. Could you please explain to me what you did?" This interaction allows the students to communicate their mathematical thinking to one another and to the teacher.

Similarly, good questioning techniques should be applied to "advance the lesson, diagnose, or to help students explore new mathematical concepts" (Callahan 1994, p. 124). Johnson (1982, pp. 9–13) proposes a variety of episodes using the art-of-questioning instructional strategy. Each episode highlights questions phrased to involve students actively in the mathematics learning process. His guideline, although not exhaustive, is appropriate for urban students in all grade levels.

The Issue of Curriculum and Instruction

We view a curriculum as those specific constructs and skills that students are expected to comprehend and apply. The development of appropriate curricula for urban youth should be guided by the culture of the stakeholders involved in the educational process (Akbar 1985).

In the process of enhancing mathematics instruction in urban schools, one must examine the curricular framework on which that instruction is built. Tate (1994) argues that mathematics instruction for African American students should build on their thinking and experiences. This implies that the urban school mathematics curriculum—that is, *what* concepts are learned and *why* they are learned—should be constantly reevaluated to assure that each student has the opportunity for meaningful mathematics learning.

The mathematics curriculum for urban students should be the same as the curriculum for suburban and rural students. There are several ways of contextualizing the mathematics so that it becomes meaningful and useful for urban school students, however (Ladson-Billings 1995). The process for contextualizing mathematics depends on instruction, and instruction depends on the learning styles of the student participants. Similar to Tate (1994), Rowser and Koontz (1995) acknowledge that instruction should reflect the experiences and interests of African American students. These experiences and interests necessitate an evaluation and affirmation of the students' learning styles.

The Issue of Learning Styles

"Mathematics … content and skills instruction are easily adaptable to instructional strategies which allow students to develop as self-confident problem solvers, form appropriate conceptual schemes, and engage in instruction based on diagnosed learning styles and needs" (Midkiff, Towery, and Roark 1991, p. 5). A learning style is a mode through which one effectively

processes information from knowledge and recall to synthesis and evaluation. Similar to Midkiff, Towery, and Roark's idea, the authors believe that teachers' sensitivity to learning styles plays a significant role in enhancing mathematical outcomes for urban school students. According to Anderson (1988), learning styles such as field-dependent/relational/affective or field-independent/analytic/nonaffective operate along a continuum of neutral value. Neither a positive nor a negative value is associated with any particular learning style. To this end, the authors profess that learning styles require assessment, not judgment.

The implication for mathematics instruction in urban schools is that the discipline itself is amenable to all learning styles; therefore, instructional presentation must embrace the perspective that problem solvers are cultivated from both field-dependent/relational learners and field-independent/analytic learners. Failure to accommodate learning style in mathematics teaching could lead to academically unsuccessful mathematics students.

EXEMPLARY PROGRAMS FOR TEACHING MATHEMATICS IN URBAN SETTINGS

The future of urban school students as successful and productive citizens in society depends on the process and progress of the education they receive in their urban setting. Urban education should continue to be the focus of inquiry for those who hold firm the belief that "education's goal must be to train all children so that they can live full lives, adapt to change, and contribute to productive work and the service of others" (Gill 1991, p. 14). Given this, it is worthwhile to reflect on a model of the larger urban school structure and, ultimately, understand how mathematics instruction can be enhanced within this structure.

Inasmuch as schools do not operate in isolation, they should be viewed as microcosms of the larger society. This view is central to Walker's (1994) conceptual model for examining issues that relate to urban schools (see fig. 22.1).

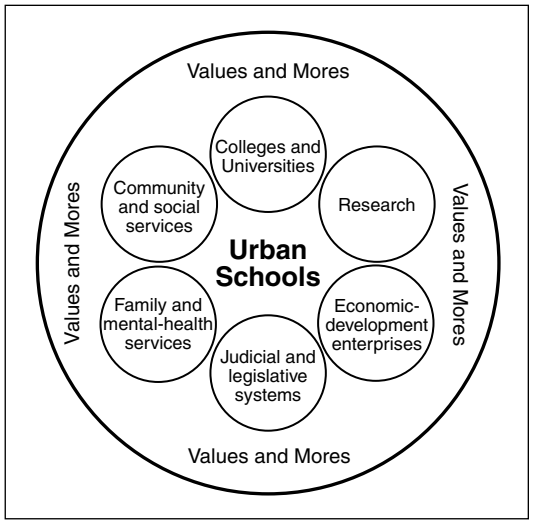

Fig. 22.1. A conceptual model of an urban education program

Although the model addresses organizational development and structure, behavior, and curricular issues, the scope of this discussion is limited solely to curricular issues. The larger circle in the model represents the context for the values and mores of the communities in which urban schools are located. The values and mores influence the experiences and interests of the students. The smaller circles within the model are those six community entities that the authors contend affect urban schools; these entities interconnect and exist within the preestablished values and mores.

The conceptual model evolved from the social learning theory (Bandura 1975) that suggests behavior may be modified if an *awareness,* an *acceptance,* and an *affirmation* of the desired behavior is explored by the behavior-modification participants. Altering the perspectives of teaching mathematics in urban schools may require a change in teacher behavior.

In recent years, numerous innovations to increase the mathematics achievement of urban students have emerged. Such innovations have ranged from small-scale projects to larger, more complex programs. One innovation is Project IMPACT (Increasing the Mathematical Power of All Children and Teachers). See chapter 6 for detailed information about this project. Another, designed to study overall mathematics education reform as well as influence the philosophy of teaching in urban settings, is the QUASAR (Quantitative Understanding: Amplifying Student Achievement and Reasoning) Project (Sullivan 1993). QUASAR's fundamental goal is to "demonstrate that disadvantaged, underachieving students can learn mathematics through a system of instruction that integrates higher-order conceptual reasoning with the learning of basic computation skills" (Sullivan 1993, p. 4). The project emphasizes increased access to high-quality mathematics instruction, improved quality of instruction, and enhanced relevance of school mathematics (Silver, Smith, and Nelson 1995).

In keeping with Gill's (1991) idea of education's goal, other exemplary programs focus on enhancing mathematics instruction for urban school students in order to increase their interest in the mathematics- and science-based professions. One such program, the Academic Year Program, is a major mission of the PRIME organization (PRIME 1994, p. 2). In designated PRIME classes, "led by teachers who are enthusiastic and creative in their teaching styles," the Academic Year Program offers motivational, enrichment, and developmental activities that illustrate mathematical applications and real-world problem solving. Other PRIME programs, like PUP (Prime Universities Program), STEP (Saturday Tutorial and Enrichment Program), PACT (Providing Activities for Careers in Technology), and Collaboration 2004, are committed to preparing African American, Latino, and Native American urban school students to succeed in mathematics and the sciences.

Lastly, Ventures in Education (Widmeyer Group 1995), an educational organization based in New York City, implements a more multifaceted approach to enhancing mathematics and science achievement for students in urban school settings and preparing them for college. Ventures

in Education helps schools and districts appraise their curriculum and instruction and improve conditions for effective educational reform. The organization prepares teachers to use student-centered instructional techniques that are research-based and designed to increase students' performance and expand their growth as lifelong learners.

Elements embedded in projects—like Project IMPACT and QUASAR—and programs—such as PRIME and Ventures in Education—challenge mathematics teachers in urban settings to understand and respect the values of their students. Teachers must recognize that the values students establish before entering school affect how they initially perceive mathematics *and* how they respond to mathematics instruction throughout their school years. The authors propose that the elements embodied in these and other exemplars should become the norm and not the exception for teaching mathematics in diverse urban school settings.

CONCLUSION

Reshaping teaching perspectives involves self-reflection, which at times might cause some discomfort. Self-reflection requires an examination of one's own value system; the image could be either pleasing or displeasing. The process, although highly productive, can be demanding and exhausting. Since the concept of "process" implies longevity, desired results are not always immediate. Long-range results are composed of varied small daily differences that ultimately add up to *big* differences. Marian Wright Edelman has stated that "we must not, in trying to think about how we can make a big difference, ignore the small daily differences we can make which, over time, add up to the *big* differences that we often cannot foresee" (Copage 1993). For mathematics classrooms in diverse urban schools, these differences constitute a powerful force that could propel mathematics teaching in these settings in a new and promising direction.

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