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ABSTRACT

Educators can learn to use the unique cultural aspects of their students to create a learning environment that fosters the acquisition of mathematics concepts and principles. When teaching students in a multicultural setting, it is important to build on the student's intuition of the subject matter, to base instruction on situational story telling, and to establish within the student a strong number sense. When possible, everyday fun-type problems should be incorporated into teaching strategies. Studying the history of mathematics can sometimes help explain why things are done, and presenting the chronological as well as logical reasons for a mathematics idea can help achieve teaching for understanding. The following strategies are particularly useful in teaching students from culturally diverse backgrounds: (1) use cooperative-learning groups; (2) use modern techniques and technology; (3) use supervised practice and time with individual students; (4) learn the special cultural needs of each student; (5) respect the sources of difference and adapt teaching strategies; and (6) discuss the history of mathematics and the contributions of diverse mathematicians. (Contains 18 references.) (SLD)

Multicultural Teaching Strategies for Simplifying Mathematical Concepts and Principles

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INTRODUCTION

Historically, mathematics has been a phobia and a difficulty for many students. Today, the number of students taking mathematics is increasing. Teaching strategies to help minimize some of the common mathematics phobias and difficulties students have can positively impact students. A multicultural education thrust should be implemented so that educators can learn to utilize the unique cultural assets of their students in creating a learning environment that will be beneficial to all students, regardless of their background (Duhon-Sells, 1992).

Demographically, the "browning of America" is often given as the major reason that multicultural education is receiving attention. The general population and the student population demographics are important to the multicultural movement and should be reason enough for race, class, and gender topics and issues to be discussed in all classrooms (Grant, 1991).

Mathematics teachers can play a greater role in multicultural education by developing and implementing strategies to assist students in the understanding of mathematics in a culturally diverse learning environment. Sleeter and Grant (1987) stated that multicultural education approaches should generally concentrate on developing curriculum and instruction practices. Until multicultural approaches become a common place in our post-secondary institutions, individual educators and their classrooms must continue to practice a multicultural approach to their teaching whenever applicable.

A continuous and concerted effort to use various motivational techniques needs to be considered in the instruction of mathematics, especially for students in special education and remedial mathematics classes. The teaching of mathematical principles by appealing to the sensibilities of the students can be more effective and productive (NCTM, 1991).

In a multicultural classroom setting, the teacher must be willing to learn about the special needs of his students, to respect the sources of differences, be willing to take the time to adapt his strategies, and to communicate his expectations (Callahan, 1994). Too often instructors in higher education teach as though all students are a "cognitively homogeneous" group who will all learn the same thing the same way. Increased diversity of students demands the need for diversity of instruction in college classrooms (Reiff, 1992). With the influx of nontraditional and international students in post-secondary courses, instruction must become more culturally responsive and appropriate in order to accommodate all students (Corno & Snow, 1986; Schmeck, 1988). The college classroom should reflect an anti-bias curriculum and instruction with learner sensitive approaches for all students at all ages (Brynes & Kiger, 1992; Huber, 1992; Jones, & Derman-Sparks, 1991).

The goals (EBRP, 1994) of a multicultural program should include the:

1. Development and implementation of strategies to help teachers and students become better informed about the nature and contributions of the various cultures and people that make up society.

2. Development and implementation of strategies to help teachers develop different styles to adjust to the needs of the group of students they are teaching.

3. Development and implementation of strategies to help educators become more aware of the harmful effects of stereotypes and biases.

4. Development and implementation of teaching strategies to help students function in their own cultures.

5. Development and implementation of teaching strategies to help students become proficient in reading, writing, and problem-solving strategies.

Multicultural Education: A Richard Paul's Pedagogical Approach

There are some common threads that permeate the teaching of all students in mathematics. Richard Paul (Paul, 1990) in his critical theory of teaching suggests several strategies to be used in the teaching of all students. Some of these strategies are listed below. These pedagogical strategies are especially adaptable to meet the special needs of students in a multicultural classroom setting.

1. **THE FUNDAMENTAL NEED OF LEARNING:** The fundamental need of all students, and therefore multicultural students, in particular, is to be taught <u>how</u> to think and not <u>what</u> to think. Paul further states that, while it is important to focus on significant objectives, this should be accomplished by introducing live issues that motivate students to research and assess the content area relative to a specific objective.

2. **THE NATURE OF LISTENING:** That students need to be taught how to listen critically. Learning what other means by what they say requires questioning, trying on, testing, and, hence, engaging in public or private dialogue with them, and this involves critical thinking. Teachers must continually model active critical listening, asking probing and insightful questions of the subject.

3. **THE STATUS OF QUESTIONING:** That students who have no questions typically are not learning, while having pointed and specific questions on the other hand is a significant sign of learning.

4. **THE PLACE OF VALUES**: That people gain only the knowledge they seek and value. Instruction should pose meaningful problems to students, requiring them to use the tools of each academic domain.

5. **DEPTH VERSES BREATH**: That it is more important to cover a small amount of knowledge or information in depth (deeply probing its foundation) than to cover a great deal of knowledge superficially.

6. **ROLE DEFINITION FOR TEACHER AND STUDENT**: That we learn best by teaching or explaining to others what we know. Students should have many opportunities to teach what they know, to formulate their understanding in different ways, and to respond to questions from others.

7. **THE RESPONSIBILITIES FOR LEARNING:** That progressively the student should be given increased responsibility for his or her own learning.

When teaching students in a multicultural setting, it is important to build on the students' intuition of the subject matter, base instruction on situational story telling, and establish within the student a strong number sense (Hattrup, 1993). The National Council of Teachers of Mathematics (NCTM, 1991) stated that a variety of instructional methods should be used in classrooms in order to cultivate students' abilities to investigate, to make sense of, and to construct meanings from new situations; to make and provide arguments for conjectures; and to use a flexible set of strategies to solve problems from both within and outside mathematics.

Current mathematics textbook problems are not always relevant and meaningful to the students. Everyday problems are usually more meaningful to the students. When possible, educators should incorporate fun type problems into their teaching strategies in order to stimulate and increase student awareness (NCTM, 1991).

Educators should evaluate their teaching by asking themselves: Are my students asking better questions-perceptive questions, questions which extend and apply what they have learned? Effective questioning techniques, that promotes student interaction must be given serious consideration (Paul, 1990).

All students must probe the significance of and justification for what they learn (Paul, 1990). Studying the history of mathematics can lead to better knowledge and understanding of the nature of mathematics. History can sometimes explain why we do things the way we do and how mathematical concepts, terms, and symbols arose. Knowing how and why a particular mathematical idea arose can help students appreciate the value of the subject and see why somebody might want to learn about it. Presenting chronological, as well as logical reasons for a mathematical idea, can help educators achieve that elusive goal of teaching for understanding (Kullman, 1987).

The use of positive role models and hands on learning experiences are also ways that educators can use to help students realize their potential in mathematics. When feasible and wise, the professor might wish to introduce the accomplishments of some of the renown mathematicians belonging to the various cultural groups within his class. Past and present performances of such mathematicians should be emphasized.

There is a significant movement in the direction of cooperative mathematics. Students should have several opportunities to teach that which they have learned, to formulate their understanding in different ways, and to answer inquiries from other students. Students must play an active role in the learning process by working with each other and choosing appropriate topics for group study. Students should use modern techniques in cooperative learning settings to make cultural and mathematical transition in the classroom. Increased attention to the use of calculators and computers as tools for learning and doing mathematics should be emphasized (NCTM, 1989).

The National Council of Teachers of English stated "that no matter what the subject, the people who read it, write it and talk it are the ones who learn it best." This statement has been endorsed by the NCTM (NCTM, 1994). When a mathematics class regularly involves writing, sharing, and discussing multicultural activities, students will discover that the content of mathematics includes the formulation of mathematical problems, as well as the solving of mathematical problems through the interpretation and evaluation of relevant quantitative and qualitative information (NCTM, 1989). Students must learn how to bring their multicultural experiences and problem-solving skills to bear on the solution process. In the process, the students learn how to formulate questions, assess information, and communicate their conclusions to others. When this is done, the students learn that the study of mathematics involves a lot more than just calculations.

A Summary of the Strategies to be Used When Teaching Students from Culturally Diverse Backgrounds

1. One teaching technique is to teach a diverse class using cooperative-learning groups. In small groups, students are expected to work together and to share ideas. These learning groups have been shown to enhance self-esteem. (Callahan, 1994).

2. Students should use modern techniques in cooperative-learning groups to make cultural and mathematical transitions in the classroom. Calculators and computers as tools for learning mathematics should be emphasized (NCTM, 1989).

3. Strategies that allow the teacher to spend extra time with individual students are especially important with new students from other cultures. Supervised practice in the classroom is a good time to diagnose students' errors and to correct improper mathematical procedures (Callahan, 1994).

4. Cultural factors may deter the students from appropriate participation in classroom activities. A willingness to learn about the special needs of each student is most important to the students (Callahan, 1994).

5. Educators must respect the sources of difference, and be willing to take the time to adapt their strategies and to communicate their expectations (Callahan, 1994).

6. The history of mathematics (Kullman, 1987) and the use of positive role models can aid in the teaching of mathematics in a multicultural mathematicians classroom setting. Introduce to the students some of the renown mathematician belonging to the various cultural groups within the class.

In the learning process, students need to come to see that only they can learn for themselves and that they will not do so unless they actively and willingly engage themselves in the process. The teacher should, however, provide opportunities for students to decide what they know, and help them develop strategies for finding or figuring it out (Paul, 1990). Students should also keep journals, develop portfolios of their work, and set questions to guide future discussions and studies in order to help facilitate the learning process (Bagley & Gallenberger, 1992).

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