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ABSTRACT

Within the framework of social reconstructivism and multicultural education, this paper explores issues of teaching mathematics, and to a lesser degree, science, to provide the best equitable education for all students. Today's classrooms are increasingly multicultural, and students bring to their classrooms rich personal, social, intellectual, and educational experiences that teachers must use. Optimizing learning for all students in mathematics classrooms can be achieved through creating multiple learning opportunities for all students as their differences are valued and celebrated. Orientations toward math learning should be both integrative and instrumental, being integrative in the sense that math is a crucial part of education and instrumental in that math is a useful tool for almost all aspects of life. In mathematics and science classrooms today, one can hardly see any sensitivity to students from diverse cultural backgrounds. Instructional techniques largely ignore the minority child because of incongruence between learning characteristics and teaching methods. Mathematics teachers should know and appreciate different math experiences and the contributions of minorities and other ethnic groups in American society. They should develop a thorough understanding of the educational implications of diversity in mathematics education and the diversity of their students. To prepare all students for their civic functions, mathematics and science educational programs should: (1) provide resources consistent with the social and educational demands of the global technological society; (2) motivate all students to learn mathematics; (3) highlight the contributions of all cultures in the area of mathematics and science; (4) create compatible teaching methods to accommodate the unique learning styles of students of mathematics; and (5) prepare teachers of mathematics to respond effectively to the cultural and linguistic variables affecting the acquisition of mathematics. (Contains 38 references.) (SLD)

A Balanced Formula for Math and Science Education in Diverse Settings

by

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Summary

Given the increasingly diverse nature of the social and educational institutions, it is vital to pluralize the educational and social treatments to actualize democracy in these institutions. In particular, schools as laboratories of social change should provide educational input conducive to the desired change. On one hand, this process involves preparing students in math to become active participants in the increasingly complex scientific, technological society. On the other hand, the overwhelmingly diverse student population requires teachers to accommodate their teaching to meet the unique educational needs of their students. Within the framework of social reconstructivism and multicultural education, this paper will explore these issues in terms of the growing demands to provide the best equitable math and science education for all. Finally, this paper draws pedagogical implications for math teachers to become more effective with all, minority and mainstream, students in order to prepare them for the technological pluralistic society.

Introduction

The United States universal culture tends to revolve around the scientific and technological advancements that are based on the principles of mathematics. Yet, the U.S. lags behind in providing effective math education for a sizable portion of the student population compared to other industrial nations. In particular, schools have not been successful in providing adequate math education to linguistically and culturally diverse

students. At the same time, the process of victimizing diverse populations has resulted in depriving the mainstream students from benefiting from the experiences of their classmates.

The basic premise of school reform is to achieve a dynamic equilibrium between learning and teaching in the diverse classroom. That is to say, we need to build on the strengths of the diverse student populations as we revisit the teaching strategies that aim to achieve congruence with the students' needs. As far as math instruction is concerned, this congruence is lacking and harming a large portion of student population.

Today's classrooms are increasingly multicultural where students bring to the classrooms rich personal, social, intellectual, and educational experiences that must be utilized. These social variable do influence all avenues of learning including the acquisition of mathematical skills. Therefore, optimizing learning for all students in math classrooms can be achieved through creating multiple learning opportunities for all students as their differences are valued and celebrated. Unless teachers and educators understand the unique needs of their students, a crisis in education will continue to be manufactured not only in math education, but also in all aspects of schooling.

Background and Context

Given the history of education in the United States, the debate has always focused on how to augment academic achievement for all students. At the same time, the assimilationist sociological accounts such as the melting pot theory have influenced schooling especially the linguistically and culturally different populations. Since these theories have always failed to affirm the diversity in the American society, the search for solutions led educators and researchers to revisit cultural pluralism in an attempt to achieve equity and justice in various institutions such as schools (Tate, 1996; Trueba, 1989). Accordingly, the seeds for multicultural movements were planted in the early 1930s during which efforts to promote sensitivity to the differences brought by students in the classroom culminated in creating alternatives to assimilationist approaches to education (Banks, 1994, 1995; Daly & O'Dowd,

1992). Those alternatives were embodied in founding several associations such as the American Council on Education (ACE), the National Education Association (NEA), and many others. In additions, they triggered initiation of many task forces to study math achievement among the diverse populations. The main function of those establishments and task forces was to develop a more meaningful approach to intergroup relations, provide support for diverse groups in order to prevent prejudice and discrimination from plaguing the society, and most significantly investigate the contemporary conditions that allowed the manufacturing of several educational crises. These associations also recognized the potential for schools and teachers to facilitate change conducive to democratic values, and offer better learning opportunities for the diverse populations while providing multiple learning contexts for mainstream students. Although major accomplishments of these alternatives (such as ethnic studies) were evident in promoting the value of diversity, those reform efforts have failed to become institutionalized (Cortes, 1990; Daly & O'Dowd, 1992; Ogbu, 1995). This is because mainstream educators failed to internalize the multicultural ideology along with misunderstanding intergroup educational reforms and their contributions to the goal of American educational system (Banks, 1994, 1995).

Furthermore, with the dismantling of segregation in the wake of the 1954 Brown decision, the original multicultural movement started to gain momentum. Ethnic pride was accordingly on the rise. In addition, several constitutional amendments contributed to enhancing diversity among people of color and affirming their metaphysical and intellectual being in the public institutions. Among others, the 1964 Civil Rights Act, the 1967 Bilingual Education Act, and the 1974 Equal Education Act contributed to the proliferation of voices for equity in education (Trueba, 1989). In particular, the purpose of this litigation was to ensure equal rights for all participants in the schools, and offer all participants equitable educational opportunities. Likewise, the National Council Of Teachers Of Mathematics (NCTM, 1989) recommended that equitable math and science opportunities should be implemented so that students who have varied sociocultural experiences can meaningfully

appreciate the evolution and significance of math in today's changing global society. Consequently, diverse student populations needing to maintain a positive self-image have become more resistant to the burdens of assimilationist demands of schooling (Deyhle, 1992; Ogbu, 1987; Reyhner & Davison, 1993).

Thus, multicultural concepts started to be infused in all facets of schooling including math and science education. Initially, the scope of multicultural education in the public educational institutions such as schools and universities took a form of highlighting contributions of diverse groups to the American civilization (Grant & Gomez, 1996). Federal money was allocated to prepare teachers and faculty to develop multicultural awareness. Moreover, the demographic changes continued to demand more to be done to develop a "greater understanding of the contributions that the various cultures could make to an increasingly pluralistic society" (Daly & O'Dowd, 1992, p. 183). Multicultural education continued to be born out of the urgent need given the complex sociopolitical contexts that allowed inequity, discrimination, prejudice, and other ills that plagued the American public schools (Nieto, 1996). In short, multicultural education was born out of the need to revitalize the American democracy, facilitate the desired change, and celebrate the diversity of all citizens in the pluralistic society (Grant, 1995).

Ultimately, "if change were to occur in the nation's schools, it was obvious that teacher-preparation institutions would have to assume a leadership role in developing programs that would enable prospective teachers to become sensitive to issues of multicultural, nonsexist education in the classroom" (Daly & O'Dowd, 1992, p. 184). Furthermore, if the diversity of the American society were to be affirmed and celebrated, prospective teachers would need to acquire the skills and competencies that help them meet the cognitive, linguistic, and social needs conducive to learning in the diverse classroom (Banks, 1994; Chisholm, 1994; Gay, 1995).

Given this historical account, it could be concluded that learners have been blamed for the failure of schools to provide adequate opportunities for math acquisition. First, although

mainstream students have partially benefited from the assimilationist instructional approaches, they were deprived of learning from the experiences of diverse students. Second, a sizable portion of student population have been "pushed out" of schools, because of the blame placed on their linguistic and cultural background, thus leading some to claim that the learner's inability to speak English interferes with the learning of math (Kimball, 1990; Mather & Chiodo, 1994). However, given what we know about learning and the universality of intelligence in all children (Chomky, 1985; Hakuta, 1986; Gardner, 1983), the problem then lies in math lesson formats and methods that may not be consistent with the diverse experiences of children (Padron & Waxman, 1992; Mather & Chiodo, 1994).

Another backlash of this crisis is the trend of students not to choose majoring in math-related areas in colleges and universities. In fact, this trend is more evident among minorities who avoid math and science courses early in life because of the poor educational practices in these areas (Aliaga, 1993; Reyhner & Davison, 1993; Trueba, 1989). In other words, learners of math lack motivation given the inequitable educational conditions in math and science programs (Oakes, 1995); teachers must convince their students about the importance of math in their lives because motivation is lacking (Reyhner & Davison, 1993). The motivational and attitudinal factors relate to the way math is delivered; when math is made easy students tend to develop positive feelings towards learning it. Also, math should not be looked at in terms of utilitarian purposes only; learners must be prepared to become math-competent to live meaningfully in the highly technological global society. In short, orientations toward math learning should be both integrative and instrumental; integrative in a sense that math is a crucial part of the education of the individual, and instrumental in that math is a useful tool in almost all aspects of life. However, when adequate conditions for effective learning of math are present, motivation and positive attitudes will develop.

Multicultural Math and Science Education

Given the increasingly diverse nature of today's classroom, the multicultural construct has become a panacea for educational problems as well as a "magic formula" for school reform. In its whole premise, multicultural education is seen as a multidisciplinary, comprehensive approach that values and celebrates the diversity of student populations; it is a concept that encompasses an array of sociological, sociolinguistic, sociocultural, psychological, philosophical, and pedagogical elements (Bennett, 1995; Grant, 1995; Garza & Barnes, 1989; Ovando & Collier, 1985). In particular, multicultural education attempts to divulge students' potential and maximize learning opportunities for *all* students. This includes giving students the opportunity to learn as many languages as possible to augment their understanding of human experience. It also involves pinpointing the universal elements of education in all areas including mathematics and science.

Moreover, in an attempt to achieve its goals multicultural education aims to sensitize teachers and curriculum designers to the unique, specific needs of culturally diverse learners. In so doing, contributions of all cultures must be addressed in the curriculum and classroom activities. This should not solely become a component to be infused in language and social studies classes; it should include all contributions of all cultures to all fields of inquiry.

In mathematics and science classrooms, one can hardly see any sensitivity to students from diverse cultural backgrounds. Needless to say, the instructional techniques in these classes largely ignore the minority child because of the incongruence between the learning characteristics and teaching methods. Using a multicultural perspective, Twiest (1992) argues that successful math experiences are "the result of teaching and expanding concepts that have relevance and meaning in all children's lives" (p. 37). To do so, we should weave in the underlying principles of multiculturalism and incorporate them in the educational goals in math programs.

According to Suzuki (1984), multicultural education is defined as a multidisciplinary educational program that provides multiple learning environments matching the academic,

social, and linguistic needs of students. These needs may vary widely due to differences in race, sex, ethnicity, or sociolinguistic backgrounds of the students and educators. In addition to enhancing the development of their basic academic skills, the multicultural education programs should help students develop a better understanding of their own backgrounds and of other groups that compose our society. Through this process, the program need to help students learn to respect and appreciate cultural diversity, overcome ethnocentric and prejudicial attitudes, and understand the sociohistorical, economic and psychological factors that have produced the contemporary conditions of inequality, alienation and ethnic polarization. Within the overarching framework of democracy, multicultural education should also foster students' and educators' ability to analyze critically and make intelligent decisions about real-life problems and issues through a process of democratic, dialogical inquiry. Finally, multicultural education should help conceptualize a vision of a better society and acquire the necessary knowledge, understanding and skills to enable them to move the society toward greater equality of freedom, the eradication of degrading poverty and dehumanizing dependency, and the development of meaningful identity for all people.

Thus, multicultural education is a comprehensive educational approach that aims to multiply learning opportunities for all participants and celebrate the cultural diversity represented in various educational and social institutions. In particular, it permeates the curriculum and teaching methods including the socialization and interactional processes among diverse participants in the culture of schools (Grant & Gomez, 1996). Furthermore, the content and methodology of multicultural education must be founded on a democratic philosophical base that reflects a clear understanding of cultural pluralism and its sociopolitical implications in educational settings (Nieto, 1996). The theoretical and pedagogical foci of multicultural approaches are centered on integration of multicultural education into not only a specific unit or course but in all content areas in a systematic and vastly expansive manner (Bennett, 1995). According to multiculturalists, to promote civic

values and instill social justice in a pluralistic society, agents of change must construct the relevant knowledge, create novel equitable pedagogical practices, and celebrate diversity in educational institutions (Grant, 1995; Banks, 1995).

Providing what deficit theories cannot offer, multicultural education affirms individuals' rights and encourages active participation of diverse groups through a democratic dialogical process (Nieto, 1996). In particular, it affirms its responsibility to prepare educators in order that they may assist all children, adolescents, and adults to understand the significance of cultural heritage in their personal development and participation in democracy. It assumes that (a) ethnic heritage is part of each person's endowment, (b) language exerts a powerful effect on development of attitudes and skills, and (c) culture influences identity and learning.

The goals of multicultural education are as comprehensive as its premises. Suffice to mention the set of goals pertaining to students and teachers of math. The understanding of these goals is necessary for implementation, because we cannot afford more lip service in the educational arena; what is needed is an educational reform that is carried out by committed education leaders who understand the needs of their students on the one hand, and their role as educators in meeting these needs, on the other.

For the most part, students of color have been victimized in math classrooms as scapegoats in the public schools (Banks, 1995). This entails blaming their diversity (e.g. ethnicity, language . . .etc.) as the main reason for their failure (Deyhle, 1992); this ranges from segregating and tracking them to having lower expectations of them in achievement and success (Nieto, 1996). In an attempt to empower all students, multicultural education challenges us to revisit the conditions inherent in the culture of schools that explain the failure of students. In other words, it maintains that the educational system has not succeeded in reaching out to the students by adapting to their needs. Accordingly, multicultural math educational solutions, based on the rich diversity, provide all students with ample opportunity to:

(1) develop positive attitudes towards math and science;

(2) acquire knowledge and skills contributed by all diverse populations;

(3) develop historical understanding of the evolution of math and science;

(4) pluralize the learning of math and other related areas;

(5) appreciate the dynamic societal changes and their impact on schools;

(6) develop awareness of the global context of math evolution;

Like students, teachers have been blamed for their failure to meet the challenge of diversity in the classroom. While teachers' attitudes, idiosyncrasies, biases, prejudices, and perceptions do influence the success of their students (Ladson-Billings, 1994; Bennett, 1995; Nieto, 1996), it is unwise to use them as scapegoats in an attempt to explain school failure. Generally, teachers tend to be the product of the teacher-preparation programs they were in. If these programs lack adequate ingredients for preparing prospective teachers, then these teachers will reflect the inadequacy of the preparation process. Multicultural education is also a source empowerment for teachers. To do so, multicultural programs have a set of goals for teachers that are equally important. Accordingly, math teachers must:

(1) know, understand and appreciate different math experiences and contributions of minorities and other ethnic groups in American society;

(2) show a thorough understanding of the nature of the pluralistic society and the educational implications of diversity in math education;

(3) develop a sound rationale of multicultural math education through a philosophical base that incorporates pedagogical principles that can be transferred to curricular areas;

(4) enhance the optimality of academic and social development of their students through the knowledge and process having sociocultural factors that influence the learning process of math and science;

(5) understand students' attitudes, values, and other motivational forces that affect the performance and achievement of students in math lessons;

(6) acquire knowledge in math pedagogical techniques that are pluralistic and multicultural;

(7) learn effective mediation and reflection strategies to account for diverse students' sociocultural backgrounds in math classrooms;

(8) utilize multicultural math materials that are sensitive and relevant to students' sociocultural backgrounds to maximize their academic achievement.

Multicultural education in general, and multicultural math in particular, is seen as a way to improve not only education for language minority children (Ogbu, 1995), but also an imperative need for educational reform. This implies that multiple learning opportunities fro all students can be provided in math classrooms. (Banks, 1994; Banks, 1995) suggests a four-level approach to such reform in the education that can be applied to math and science education. This multi-level conceptualization includes the action approach, the transformation approach, the additive approach, and the contributions approach. These approaches can serve as a useful tool in promoting math and science skills in multicultural settings. First, students are encouraged to take action to solve learning including math and science problems in terms of their meaningful way of interaction bound to the social and cultural make-up. Second, the multiculturally transformed math and science curriculum enables learners to view math and science concepts and meanings in terms of cultural diversity. Furthermore, students are afforded with added universal elements of science and math that enrich their educational opportunities in math and science classrooms. Finally, students see themselves and their cultures through the contributions of pioneers and leaders in math and science who represent these students in today's classrooms.

Since math is taught in such a way which is delinked from the life of learners (Oakes, 1985; Secada, 1991; Deyhle, 1992), the multicultural math approach is more comprehensive and more attuned to meeting the special needs of all students. In fact, mathematics is intricately linked to the structural development of diverse societies, and its sociocultural context provides a lens to view it as a cultural product; so "it is important that all students

understand how mathematical representations like networks are connected to the lives of people in various cultures and societies" (Tate, 1996, p. 192). The implementation of this approach is also consistent with the long journey for seeking workable solutions facing American schools, so that "Eurocentric mathematical principles" must not be imposed over other diverse groups (Tate, 1996). In short, it is a way of globalizing and humanizing the evolution of mathematics by showing that its development is a natural response to human needs (Addison-Wiseley, 1993, p. 3), and consequently its teaching ought to be pluralized to make it more meaningful in the life of all students (Tate, 1996).

Teaching Math and Science: Blueprint for Teachers

Based on the above framework, it is evident that teaching math should be provided in an inclusive, expansive manner. In other words, this comprehensive approach to pluralizing math education should not only be multicultural but also social reconstructionist so that " it promotes social and structural equality and cultural pluralism" (Grant & Gomez, 1996, p. 10). This perspective involves effective teaching strategies that allow students become active participants in the pluralistic classroom, and affirms the collaboration and reflection necessary for academic and social growth inside and outside schools (Tate, 1996). Most importantly, it bridges the gap between theory and practice so that teachers can "shape their educational philosophies and develop teaching strategies for successfully teaching all students" (Grant & Gomez, 1996, p. 10). This notion is inherent in many consrtuctivist approaches that appeal to teachers in the classroom. For example, (Vygotsky, 1978) revisited the role of teachers showing himself a thorough student of Dewy in his construct of democratizing education for all students.

As far as math is concerned, researchers (e.g. Tate, 1996) find both constructivist and multicultural social reconstructionist approaches appealing. In this sense, learning is a mediated activity in which children interact meaningfully with the world around them; this includes cultural patterns embedded in language and numeration. As (Khisty, 1992) put it,

the "learning of mathematics is based on the essential ingredients of people engaged in communication for the purpose of developing shared meanings and understandings" (p. 664).

The major task of math teachers then in diverse classrooms is to engage students in culturally relevant tasks that help them process math from concrete experiences to making abstract generalizations. These tasks must be built on the assumptions that students come to the class with informal information about mathematics, and have their own preferred ways of learning math. Thus, classroom settings and activities must represent students' experiences. Therefore, the exploration and processing of mathematics by various cultures and the way first mathematicians operated should be reflected in today's math classrooms so that multiple learning opportunities are provided for all students (Addison-Wiseley, 1993; King, 1995; Lee & Slaughter-Defoe, 1995; Oakes, 1995; Tate, 1996).

Moreover, since reading a math problem does not necessarily mean understanding the logic behind it, both reading and critical thinking are significant in math learning and instruction. Thus the relationship between understanding math and the language used in math instruction cannot be undermined. In particular, students from linguistically diverse background usually come to school with a basic understanding of math concepts given their underlying cognitive abilities (Chamot & O'Malley, 1987; Cummins, 1989; Padron & Waxman, 1992). The linguistic cues in math lessons are significant to both learning and instruction (Winograd & Higgins, 1995). Generally, terms used in math lessons have several cultural connotations to the learner of math. Since "mathematics is a different and difficult subject to explain partly because of the language we use to communicate mathematical ideas and also because the ideas are not straightforward" (Khisty, 1992, p. 636), special considerations should be kept in mind when teaching mathematics in a multicultural setting. Specifically, the relationship between language development and cognitive, linguistic, social, academic, and intellectual growth of children in multicultural/multilingual settings has been thoroughly investigated by several researchers in

the field (O'Malley & Chamot, 1990; Garcia, 1991; Hakuta, 1986, Krashen, 1981). Evidence is also provided that bilingual instruction is beneficial to the child and contributes to his/her success in school (Hakuta, 1986; Garcia, 1988). The conclusions of these studies have useful implications for teaching math in multicultural settings. Some of these conclusions are:

(1) There is an intricate relationship between language and math;

(2) If one learns math in a native language, s/he need not re-learn math in another;

(3) Proficiency in language is related to proficiency in math;

(4) Teachers' expectations of their students are related to students' math achievement;

(5) Math instruction impacts math learning;

(6) All students are intelligent in many ways including linguistically and mathematically.

Similar findings about difficulty in learning math as it relates to language, culture, and cognitive styles of the language minority child (Davison & Schindler, 1988; Garcia, 1991; Ogbu, 1995), have prompted researchers to investigate the reason why language minority children achieve less in math. For example, Reyhner & Davison (1992) investigated the role of "ethnomathematics and ethnoscience" as they relate to the Limited English Proficient (LEP) child's interests and needs. They conclude that using bilingual multicultural materials and instructional techniques "will make it easier for LEP students to buy into schooling" (p. 550). Focusing their research on LEP American Indian students, Reyhner & Davison (1992, pp. 570-572) provide the following recommendations and conclusions:

(1) Teachers must relate to their mathematics instruction to the out-of-school life of their students;

(2) The implementation of ethnomathematics can help teachers relate to those subjects in their students' out-of-school lives;

(3) Teachers must "contextualize" what they teach;

(4) Teachers need to be concerned about the affective factors in the classroom;

(5) Teachers of math and science need to provide writing and other language development activities for their LEP students.

This requires teachers to engage their students in a wide range of classroom activities so that consistency between learning and teaching math is established. Such flexibility would allow students to solve word problems as they attempt to identify key words and mathematical jargon. Meanings can be communicated through simple wording from the teacher as well as repeating significant concepts and terms to translate math abstractions into meaningful experiences. Math-specific meanings should be clarified by teachers to fit the cultural and cognitive expectations of all students (Mather & Chiodo, 1994, p. 2).

In addition, there is a close relation between thought processes and language on one hand, and the math codes on the other. Therefore, it should be borne in mind that teachers need to harness these cognitive abilities by "minds-on" activities whereby learners are creatively engaged in solving math problems. These strategies should also be balanced with "hands-on" activities and concrete experiences that allow the context of learning become enriched as students engage in doing language and mathematics simultaneously. Such activities may be literacy-based or literature-based to help students understand and reason the utility of math in real life and contexts (Winograd & Higgins, 1995).

Also, language-related activities such as writing and rewriting mathematical problems help students' acquisition of math and its language. When students are asked to rewrite a problem to other students "to clarify their understanding of the word problem," they discover the underlying premises of the logical processes relevant to abstract mathematical problem solving (Perez & Torres-Guzman, 1992, p. 123). All other language activities such as talking math out-loud, journaling, . . . and learning logs, are all fruitful activities that help students substantiate and translate the concepts of math using a student-centered meaningful language (Padron & Waxman, 1992).

Similarly, math can be taught using prosodic and suprasegmental language features through singing and rhyming activities. This added element of entertainment will help motivate children enhance their math and language skills simultaneously. This will motivate students to learn the basic operations of math such as addition, subtraction, multiplication, and division. By attempting to maintain a rhythm, literacy in math emerges as it does in language arts. In so doing, children are "both playing with language and clarifying math concepts" (Perez & Torres-Guzman, 1992, p. 124).

Another set of relevant activities in math classrooms are community-oriented activities in which students collaboratively make learning a mutual process: students learning from their peers and their facilitator and vice versa. At the same time students take charge of their learning as they gain more control in problem solving situations. As in any other classroom setting, peer learning can be extremely productive in developing mathematical skills that are cultivated in terms of cultural variables in learning and teaching mathematics (Lee & Slaughter-Defoe, 1995; King, 1995).

These student-centered activities, along with many others, can be created to match the unique needs of all students. At the same time, teachers will continue to be inspired to create more meaningful activities by their math students. Unless these activities center around harnessing the (meta)linguistic, (meta)cognitive, (socio)cultural abilities of all students, mathematics as a necessary aspect of pluralistic education will be avoided by a vast majority of learners. By pluralizing math education, teachers seek to create a challenging, but less-threatening, climate for learning in math classrooms. Finally, math teaching should go beyond individual seatwork activity to include diversity of techniques based on the diversity of students; also it should go beyond the Eurocentric classroom culture to embrace all cultures represented in the pluralistic learning/teaching environment.

Conclusion

To pluralize math education, it is important to revitalize democratic values in light of the increasing diversity in today's classrooms. This paper has attempted to provide a comprehensive account of math education within the multicultural construct. The promising educational outcomes in incorporating multiculturalism in math classes are consistent with the civic function of individuals in the pluralistic technological society. To prepare all students for their civic function, educational programs should (1) provide math resources consistent with the social and educational demands of the global technological society; (2) motivate all students to learn mathematics; (3) highlight contributions of all cultures in the area of math and science; (4) create compatible teaching methods to accommodate the unique learning styles of students of math; and (5) prepare teachers of math to effectively respond to the cultural and linguistic variables affecting the acquisition of math.

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