Teaching Mathematics Concepts Using a Multicultural Approach

Frederick L. Uy, California State University – Los Angeles
fuy@calstatela.edu

Today's student population continues to change rapidly and steadily reflects the myriad of cultures it represents. Culture, in this particular instance, includes but not limited to ethnicity, socio-economic status, language, geographic origin, learning manner and abilities, gender, etc. Given this situation, it is sensible to reexamine our teaching approaches and to ponder the role of multicultural approach in the teaching and learning of our students, particularly in the subject of mathematics.

Why is multicultural approach needed in teaching mathematics?

A multicultural approach in teaching mathematics is important because it:

Humanizes mathematics lessons and topics – People all over the world have developed mathematics practices consistent with their needs and interests, specifically for practical, aesthetic and recreational purposes. Many cultures have developed counting practices consistent with their needs. Others also have made use of arts and designs that were rich in symmetry, transformations, proportions, etc. Finally, many cultures developed games and other fun activities that employ mathematics concepts such as networks, strategies, and patterns.

Includes all students and boosts the confidence levels of students – Doing mathematics is a universal activity; hence, everyone does some form of mathematics. Therefore, students see that mathematics is indeed for everyone and not for a few.

Gives a holistic learning and connects to other disciplines (interdisciplinary approach), and determines the usage of mathematics in society and in other groups – Students see the application and connection of mathematics not only in other disciplines but also in the real world. When students get exposed to the use and importance of mathematics in the real world, questions like "Why are we learning this?" and "When are we ever going to use this?" are answered automatically and clearly. Also, different professions and jobs use mathematics differently and accordingly.

Corrects inaccuracies within mathematics, increases the universality of mathematics, and recognizes and acknowledges the existence of "other" mathematics – In using a multicultural approach to the teaching of mathematics, the teachers are helping to overcome the existing deep-rooted Euro-centric bias relating to the origins and practices of mathematics. For example, is it still accurate and correct to call it Horner's Method when the Chinese have used it about four hundred years earlier? (Li and Du, 1987) Also, multicultural teaching gives a clearer picture of how mathematics is done and practiced formally in an academic setting and informally outside the classroom. For example, drawing a rectangle in an academic setting will most likely start with the sides rather than with the diagonals, a practice commonly used in some parts of Africa (Gerdes, 1999).

Gives an education in awareness of students' background(s) – It is true that students learn from teachers; however, it likewise is true that teachers learn from their students. Hence, making use of a multicultural approach enriches both students and teachers as they understand and value each other better.

Promotes critical thinking – Due to the fact that multicultural teaching of mathematics is multi-faceted, the students think of the subject more deeply and more broadly. The thinking, learning and application of the concepts are done in multiple perspectives.

Is consistent with constructivism – Constructivism advocates the use of students' prior knowledge and examples that they could relate to and be familiar with. What better relationship and familiarity can be used other than the students' own cultural background? Our students will appreciate the example and relate to the inclusion practices better.

Who are needed in using a multicultural approach in teaching mathematics?

The key players in the multicultural teaching of mathematics are:

Teachers
Without a doubt, it is important to start with the teachers, as they are the ones who maintain daily contact with the students and have very great impact in the students' lives. The following are a sample of what teachers may do: read and research on topics for accuracy; incorporate backgrounds (historical, cultural, ethnomathematical) of the topics; communicate and confer with other teachers, curriculum developers, and supervisors in their grade level, school and district; attend and present workshops; plan ahead; involve parents as they are a very good resource; employ assessment instruments and practices consistent with the teaching and learning of topics; coordinate extra-curricular activities to further study the topic; continue evaluating and reflecting on lessons to determine the revisions needed.

Curriculum Developers and Supervisors
Curriculum developers and supervisors are often the liaison between the classroom and the district office. Aside from those listed above, the curriculum developers and supervisors must advocate the use of multicultural teaching of mathematics; continue to read and research on topics for accuracy; and maintain availability of resources.

Principals and School Administrators
Principals and school administrators play a significant role in the multicultural teaching of mathematics. First and foremost is that they should believe in their teachers and students. They must provide support to teachers – pedagogical, technical, financial, etc. As it is essential for teachers to meet and plan, some release time for teachers would be ideal. It also is their responsibility to communicate with parents so that these parents are not uninformed and misinformed. Lastly, as the leader, they have the authority to involve and encourage the whole school.

Parents
Parents are a vital part of the learning community as they are valuable resources for our classrooms. They certainly can offer suggestions and ideas based their own background on how they use mathematics in their own lives and jobs or how they solve a mathematics problem. We need to see them as allies and willing participants in the education of their children.

How is a multicultural approach in teaching mathematics employed?

Now that the importance of multicultural teaching of mathematics has been demonstrated, where and when will it appear in the mathematics lesson? First, a multicultural approach may be used to introduce a lesson. One may discuss the cultural and/or historical background of the topic or show how the topic is used in the real world. For example, a lesson on triangles may begin by showing an example of a Hawaiian petroglyph or discussing that the early Egyptians used right triangles to survey land after the annual flooding of the Nile River. You may also show some tools shaped like a triangle and talk about its significance and use.

Second, a multicultural approach may be used to develop a lesson. A teacher is encouraged to use multicultural examples and perhaps even art forms like baskets, masks, novels and literature, designs,

music, etc. For example, a discussion on patterns, relations or even algebraic functions may use family structure or kinship as an example. Designs are often rich in discussing geometry concepts. An African mask may be shown to determine symmetry, line or rotational; or a story or folktale may be incorporated to show logic (Alice in Wonderland) or strategies (any of the many stories about crossing the river).

Third, a multicultural approach may be used to extend a lesson. Both teachers and students may develop a particular mathematics topic further by doing a research project, going on field trips, inviting speakers and experts, presentation of work at a multicultural fair, etc.

Fourth, a multicultural approach may be used to connect thematic and/or interdisciplinary units. Themes like early civilizations (Egyptian, Chinese, Greek, or Pre-Columbian American), women studies, environmental studies, migration, and diseases are commonly used in the classrooms. Teachers in a self-contained classroom may find the use of thematic units less problematic compared to specialists as they have more and better control of their classroom time. Specialists are encouraged to communicate and plan well with colleagues of other disciplines.

Finally, a multicultural approach may be used to celebrate holidays, festivals and special events. In as much as we do not want our multicultural teaching to fall into and be limited to the three f's – *food, festival and fairs*; however, these three are readily available and give a natural setting for multicultural teaching. How can one talk about New Year Celebrations (Jewish, Islamic, Lunar, Tet, etc.) and not use them to capitalize on comparing and contrasting solar and lunar new years or understanding the leap year? Celebrations like Christmas, Kwanzaa, Hanukkah, Eid, Dia de los Muertos, Deepavali or Divali, etc. are rich sources of mathematics connections in counting and measurements. Events like Summer/Winter/Special Olympics and elections offer lessons in time, ordinals, graphing, etc. The connections and possibilities are endless!

What are the guidelines in using a multicultural approach in teaching mathematics?

In as much as multicultural approach to the teaching of mathematics is advocated, one must not forget that there are some important directives or guidelines to which the teachers adhere. The author lists eight basic guidelines, the last six of which were modified from Davidman and Davidman (1994). In the multicultural teaching of mathematics, the lesson strives to:

- *Present accurate mathematics content, which is not lost in the process of the lesson.*
    Many times, the lesson becomes so enriched with the other features that the mathematics got lost in the process. Our first and foremost objective is to be able to demonstrate the mathematics concept(s) of the lesson; the rest are secondary. The activities clearly exhibit the mathematics content.

- *Use learning outcomes reflecting the objectives and bias-free assessments.*
    The lesson must be aligned with the standards, whether NCTM, state or both, and the activities make clear use of the learning objectives. Further, assessment of these students must be totally fair.

- *Uphold educational equity.*
    The lesson must have taken into consideration the entire composition of the students and was developed so that access is equitable for all students.

- *Develop collaboration and empowerment in the entire learning community.*
    Always think whether someone from the learning community was left out in this lesson. Could the lesson have been improved if the parents were consulted in the process? Would other teachers in

the school benefit from this lesson? Would an interdisciplinary approach considered in the teaching of this lesson, if so, what actions were taken? These questions are but a few of the examples of some ideas to consider.

- *Promote cultural pluralism in society or inter-group harmony in the classroom.*
    Does this mathematics lesson isolate or integrate students in the classroom? How did the group that was not mentioned feel? Was there acceptance of other culture at the end of the lesson? Was there appreciation of other culture at the end of the lesson? Make every effort to include all students.

- *Help increase the students' knowledge of various cultures, including their own.*
    Are the students aware of other cultures after the lesson? Did the students relate the topic to their own group? Was there an effort to show familiar application of the mathematics topics?

- *Enable students' interest and ability to see and think with a multicultural perspective.*
    Are students more appreciative of the diversity they are in? Do students see differences and diverseness as assets and not liabilities? Are students aware that there are other ways to learn ideas, to do ideas, and to present ideas? Algorithms on how to multiply would be an excellent example.

- *Help correct inaccuracies.*
    How was the treatment of the bias, if any? Was the inaccuracy mentioned and discussed? What measures were taken to make sure that no further disregard of the inaccuracy or inaccuracies was done?

These guidelines are meant to help teachers and curriculum developers in designing a lesson in multicultural teaching of mathematics. These also can help mathematics supervisors evaluate current lessons and practices in their schools and districts. Both parties are encouraged to rewrite these guidelines, as there still may be some missing.

Conclusion

To summarize, a multicultural approach in the teaching of mathematics benefits not only the students but also the teachers and everyone else in the learning community. As noted, it humanizes mathematics lessons and topics; includes all students and boosts the confidence levels of students; gives a holistic learning and connects to other disciplines (interdisciplinary approach), and determines the usage of mathematics in society and in other groups; corrects inaccuracies within mathematics, increases the universality of mathematics, and recognizes and acknowledges the existence of "other" mathematics; gives an education in awareness of students' background(s); promotes critical thinking; and is consistent with constructivism.

With these justifications, it is only but reasonable to review and revise our mathematics curriculum and teaching to accommodate the needs of students with diverse backgrounds. After all, this is practice is consistent with the Equity Principle in the Principles and Standards for School Mathematics (NCTM, 2000). Additionally, Manning (1993) suggested that educators should provide culturally appropriate activities and teaching and learning experience that reflect culturally diverse students' learning styles and the learner's role in the teaching and learning process. Furthermore, mathematics that is taught with consideration for the cultural, racial, ethnic, and religious backgrounds of the students will encourage certain students who often exhibit little or no interest in the subject (Vogeli, 1993). Finally, a multicultural teaching of mathematics provides more meaning to the mathematics studied, shows more appreciation of mathematics and other cultures, and makes students become more motivated and more cooperative in studying mathematics (Uy, 1996). Truly, it is essential to reexamine and reevaluate our

current teaching practices and mathematics curriculum so that they indicate a multicultural approach in teaching and uphold equity. As a true testament of how our mathematics teaching and curriculum should embrace equity and diversity, the author ends with the Every Child Statement.

The "Every Child" Statement

As representatives of a professional organization and as individuals within that organization, the Board of Directors sees the comprehensive mathematics education of every child as its most compelling goal.

By "every child," we mean every child--no exceptions.

We are particularly concerned about students who have been denied access to education opportunities for any reason, such as language, ethnicity, physical impairment, gender, socioeconomic status, and so on. We emphasize that "every child" includes—

- learners of English as a second language and speakers of English as a first language;
- members of underrepresented ethnic groups and members of well-represented groups;
- students who are physically challenged and those who are not;
- females and males;
- students who live in poverty and those who do not;
- students who have not been successful and those who have been successful in school and in mathematics.

The Board of Directors commits the organization and every group effort within the organization to this goal. (NCTM, 2000)

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