

Chapter 14

Social and cultural issues in mathematics learning

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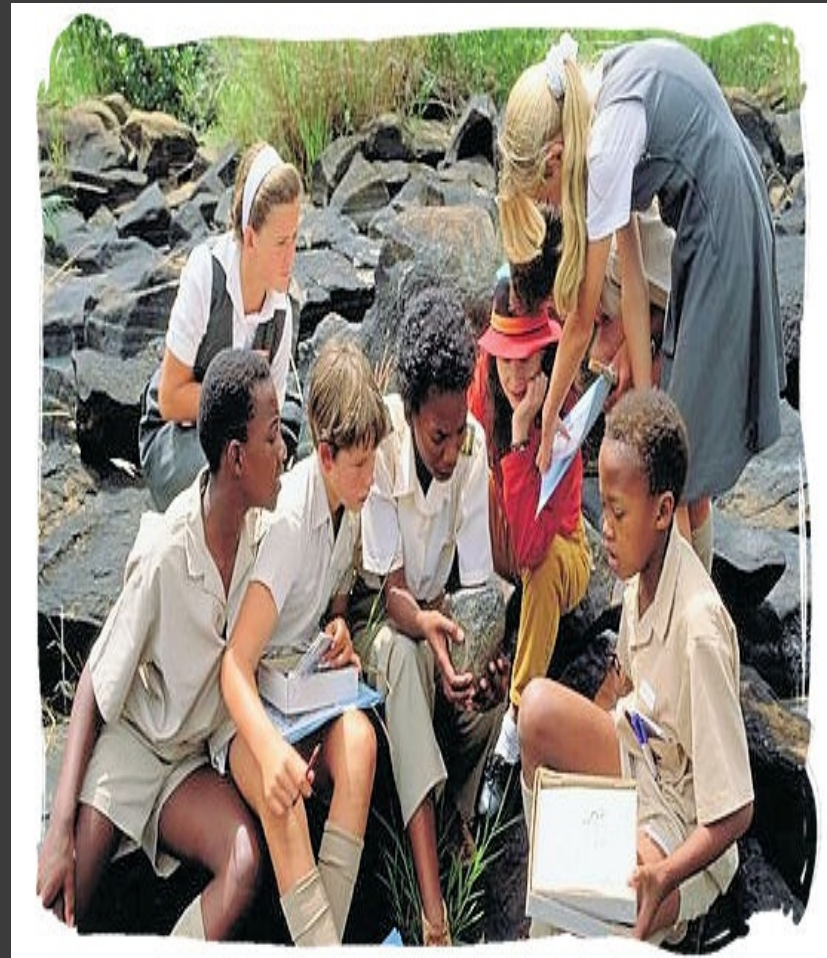
Social and cultural Issues in Mathematical Learning

- What do you see when you look at these people?
- Typical North American Class?
- Cultural Diversity?
- Issues?



Social and Cultural Issues in Mathematical Learning

- What do you see when you look at these people?
- Is it the same as the last slide?
- Will these children have the same opportunities?
- How will they cope?



Social and Cultural Issues in Mathematical Learning

- ① Cultural heritage and social backgrounds are related to to advantages in schooling, hence educational success.
- ① Western Countries prepare for citizenship focusing on the social and cultural issues.
- ① Many Countries don't focus on this due to lack of available money for education, pride in one particular culture, and/or lack of belief.

Social and Cultural Issues in Mathematical Learning

- ⦿ Problem that affects the whole world.
- ⦿ Students suffer in school due to not being able to understand current lessons and being unprepared for future ones.
- ⦿ In Mathematics this understanding is essential to be able to fully grasp what is intended to be learned.

Social and Cultural Issues in Mathematical Learning

- ◎ We need to look at what primary effects this relationship between Social and Cultural learning:
 - Socioeconomic status
 - Language
 - Ethnomathematics

Socioeconomic Status

- The social and economic measure of an individual's position relative to others around him/her.
- Socioeconomic status is a common factor in influencing students in mathematics.

Language

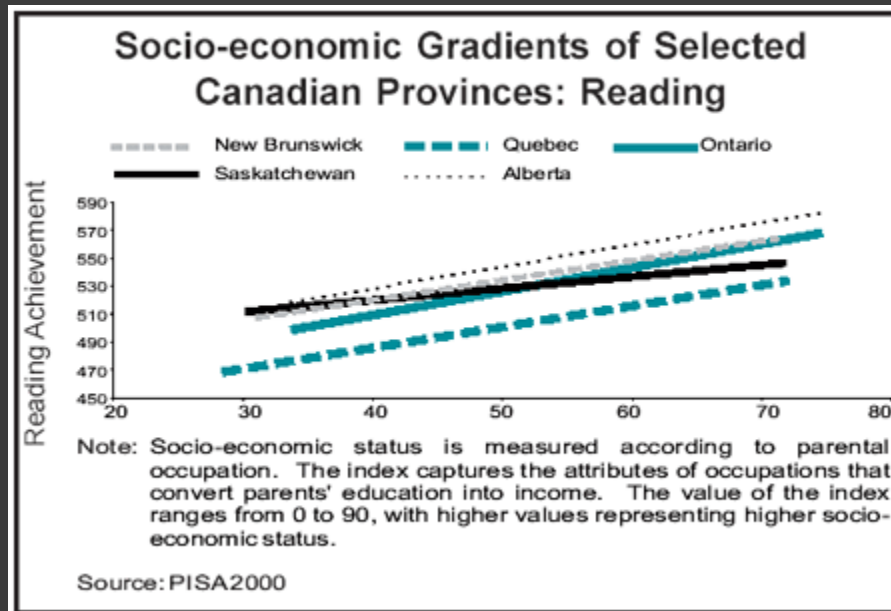
- The chosen language that is not only spoken in class but used in long answer questions and problem solving.
- Students struggle with understanding concepts of whats being asked when they do not understand the question.

Ethnomathematics

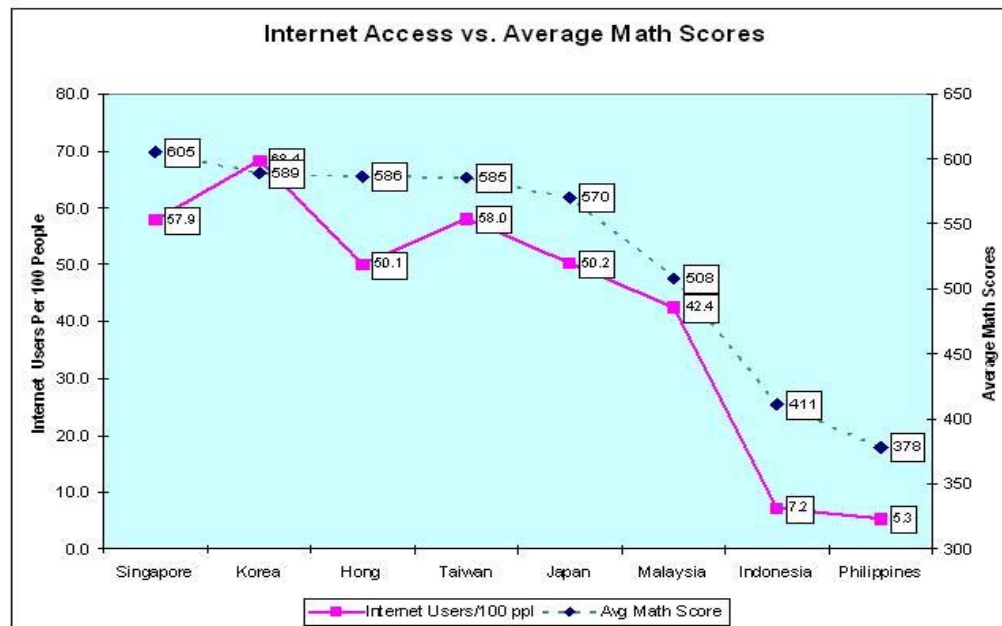
- ① The study of the relationship between one's culture and mathematics.
- ① Often the connection between the two is the key to overcoming this problem in mathematics.

Socioeconomic status and mathematics achievement

- Canadian studies show that there is a correlation between math achievement and socioeconomic status.

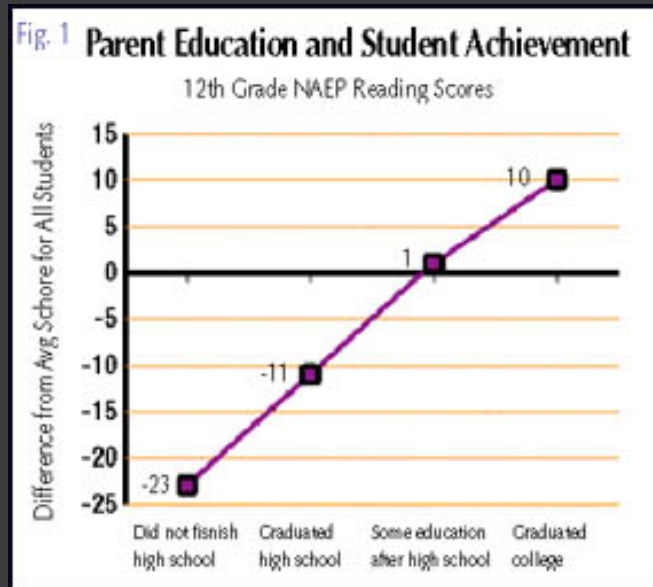


- Social capital is used as one way to explain the correlation between social status and mathematics achievement.
- One example of this is with students who have access to the Internet at home.



Another example of social capital is the extent of parental education.

It is shown that the more education a parent has, correlates to a child's academic success.



*It has also been shown that youth from lower-class neighbourhoods have less access to quality instruction.

*And, youth from lower class surroundings are less able to answer “real-world” type questions.

*From the text,

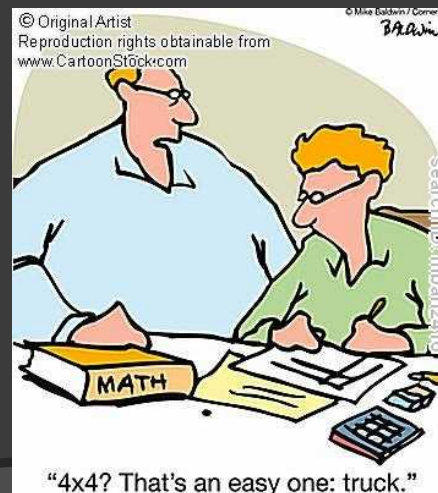
“ For example, when solving a problem about a bus timetable schedule, some working-class students explained that the bus didn't run on a Saturday at that time. Middle-class students, on the other hand, recognised that the context of the problem was irrelevant to the solution, and were able to interpret the problem and provide the correct solution.”

Language & Language Background

- With the exception of Indigenous Students mathematical achievements is not related to cultural background or language spoken at home (Lokan et al., 2001)
- When teacher and students do not share the same language, problems start occurring.

Language & Language Background

- Mathematical problems can be difficult for students whose first language is not English.
- It's not usually the English Language itself but the mathematical language.



Language and Language Background

Ways to improve this problem:

Use short sentences

Use simple words

Remove unnecessary material

Keep present tense

Avoid starting with sentence clauses

Language & Language Background

- Example:

There are 5 birds and 3 worms.

How many more birds are there than worms?

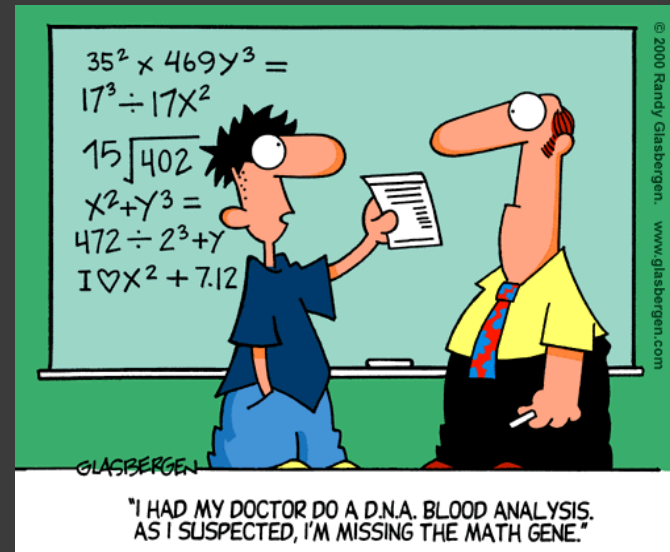
- Revised: (last line)

Suppose the birds all race over and each one tries to get a worm! How many birds won't get a worm?

Sociocultural norms and teachers' practices

Sociocultural norms of the classroom:

- * Language
- * Styles of communication
- * Classroom rules



Ways of communication to exclude students:

- * Teachers must ensure that they are not excluding students by the language that they are using in the classroom.



- * Teachers must ensure that they do not judge a student's work on their background
- * Teachers must also ensure that they are open-minded
 - For example, if a student comes from a different country or culture, they may have a different way of learning that is also acceptable



Equity and Social Justice

- ⦿ There will always be students who are at a disadvantage in the classroom.
- ⦿ “I always use the analogy that we’re all running the same race in the end, but our kids are jumping hurdles. Some kids are running flat races. If you’re at [private school in an affluent suburb], you’ve got a pretty easy hundred meter run. Our kids tend to fall because they’re jumping over stuff. So to me the school has to make up for that, so [social justice is] about taking away those hurdles.”

Equity and Social Justice

- Teachers will need to spend more time with struggling students
- Equity and social justice does not mean equal treatment, but we must embrace fairness and mutual respect in response to difference. Social justice is about closing the gap, levelling up and empowering students

Approaches to equity and social justice

Approach	Assumption	Curriculum	Teaching	Language
Traditional	No Issues	Traditional	No modification	English
Assimilation	Students culture should be useful for examples	Multicultural	Caring approach with some group work	English plus ESL Teaching
Accommodation	Students culture should influence education	Ethnomathematics	Modified to style preferred by students	English Language support and acceptance of home language in the classroom
Amalgamation	Culture adults share significantly in education	Democratic	Shared or team teaching, bi-cultural teaching	Bi-lingual

Approaches to Equity and Social Justice

Bishop provides a outline which describes 4 different ways to solve this problem:

- Assimilation
- Accommodation
- Amalgamation
- Appropriation

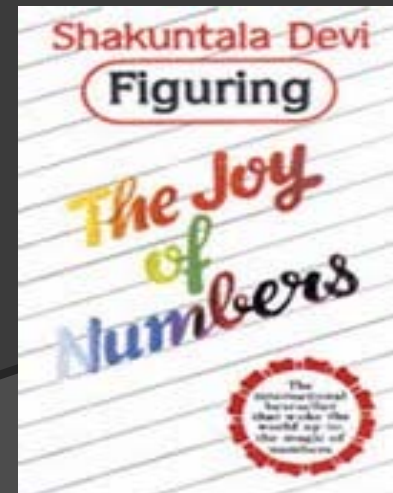


Multicultural curriculum

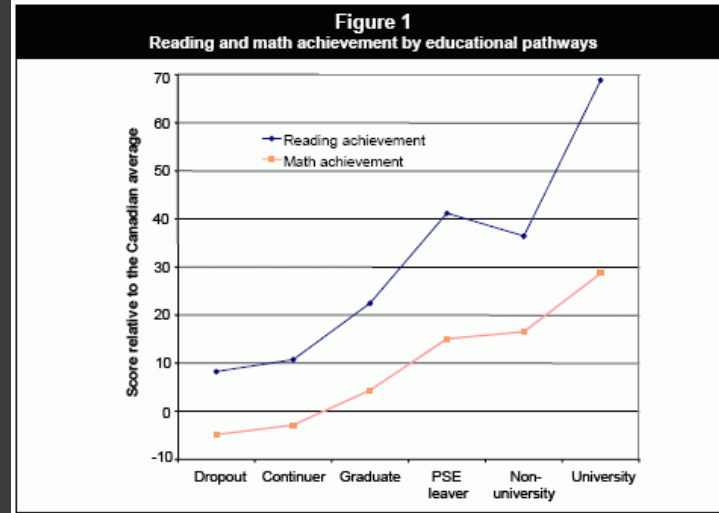
Characteristics:

- * A caring environment
- * The use of contexts and problems with cultural significance to students.

http://vedicmathsindia.blogspot.com/2007_06_01_archive.html



- If a teacher has students from many different cultural backgrounds he/she must not only recognize their prior mathematics knowledge, but also their language skills.
- In order for quality instruction to occur, a teacher must be familiar with their student's capabilities.



- If a teacher is familiar with his/her student's backgrounds, that teacher can provide relevant examples in class to keep their students engaged.
- For example, Pythagorean triples, were actually discovered by the Chinese long before Pythagoras.



Another Example

- The factorial system was first discovered in 1730 by Scottish born, James Stirling.



<http://nrich.maths.org/public/leg.php?code=14>

- If the native language of students' is not what's being taught in the classroom, than it is the teacher's responsibility to ensure that students understand what is being taught.



<http://www.clipartof.com/details/clipart/6027.html>

From text, some examples to ensure that students are understanding the language being used are:

- * Labelling exercises using key terms on cards;
- * True/false exercises for mathematical statements written in words;
- * Cloze exercises where sentences are completed using a list of words;
- * Problem reconstruction, where steps in the solution process are written separately on cards using symbols and words and students arrange both sets of cards to show the solution process;

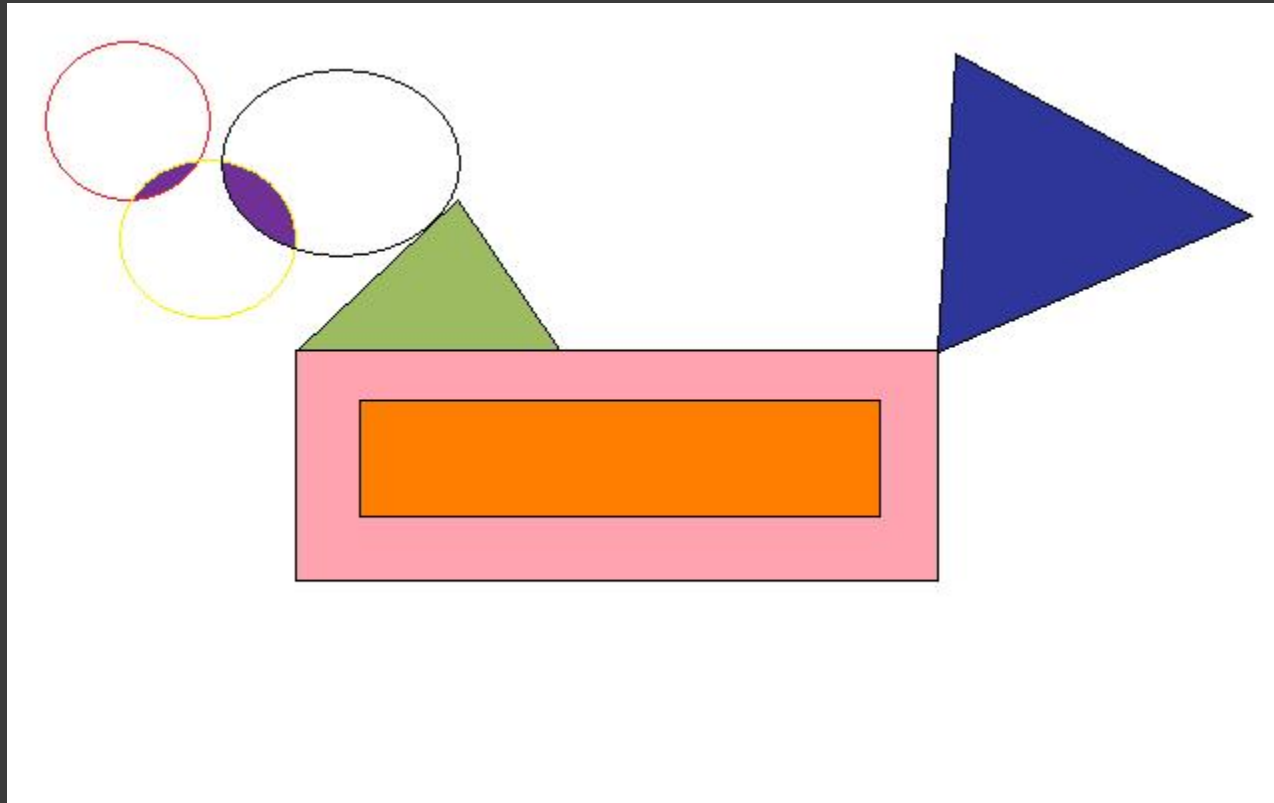
From text, some examples to ensure that students are understanding the language being used are:

- * Mix-and-match cards-for example, cards to match graphs with written descriptions of their features, or mathematical vocabulary and their meaning; and
- * Cooperative learning problems, where clues or pieces of information about the problem are written on separate cards, and distributed among a group of students who have to share their information by reading and explaining and not showing, to solve the problem together.

<http://www.freewebs.com/greomatic/week2.htm>

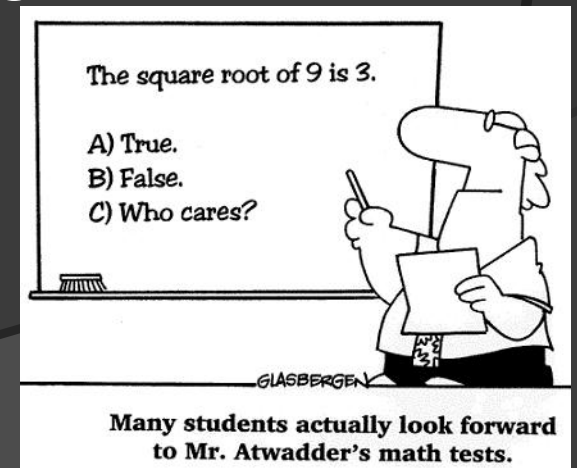


CLASSROOM ACTIVITY!!!



Ethnomathematics

- Is the study between Mathematics and Culture
- Ethnomathematics curriculum differs from multicultural curricula because it is reconstructed from cultural knowledge rather than just including some examples.



Ethnomathematics

- Ethnomathematics has been investigated from three approaches: the mathematical knowledge of traditional cultures; the mathematical knowledge in non-western societies; and the mathematical knowledge of different groups in society. (Bishop 1994)

Ethnomathematics

- “It is important for Indigenous students to understand the quantity, relationship and space system of their own culture in order to appreciate and understand another system.”
- “A school-based curriculum that includes examples from traditional culture runs the risk of not only trivialising the mathematics but, more importantly, embarrassing the students from ethnic minorities because they are made to feel primitive rather than engaging their interest and valuing their culture.”

Democratic or critical curriculum

In this method, teachers have adopted a method in which students will complete self-studies that are connected to their environments and heritages.

In 2005, in Newfoundland & Labrador, the Cultural Connections plan was developed.

This method can be helpful, when trying to relate mathematics to the real world.

* From the text,

Table 14.2

If you were planning to drive to and from a party and stay from 8:00 pm to 1:00 am, what number, capacity and strength of alcoholic drinks could you drink in that time and have a blood alcohol content (BAC) below 0.05 any time after leaving the party? Explain.

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* From the text, “ An important aspect of the democratic approach is student involvement in making decisions about their learning.”

* In this method, teachers facilitate learning, by discussing projects with students, encouraging students to justify their thinking, and making real-world contexts, however the learning is more up to students.

Show Me Your Math: A Case Study

Overview

- David Wagner of The University of New Brunswick and Lisa Lunney of St. FX University collaborated on a project entitled 'Show Me Your Math' as a method of celebrating mathematics within aboriginal communities.
- The design of the project was intended to allow children of aboriginal communities to explore mathematical concepts that are inherent to their traditional culture. The method by which this was achieved was largely through interaction with elders to find mathematical concepts that related to traditional and modern community practices.

Mathematical Activity Defined

- At first glance, mathematical concepts that are currently incorporated into curriculum do not seem to easily identify with aboriginal cultural understanding.
- The aboriginal perspective of mathematics is reflected more accurately by Alan Bishop's definition of mathematical activity:
- Mathematical Activity: Practices that involve counting, measuring, locating, playing, designing or explaining.
- In this context, students were able to relate mathematical concepts to traditional cultural aspects.

Program Highlights

- The program has been running annually since 2007, attracting increasing numbers of schools.
- Involvement from aboriginal peoples from both Mik'maq and Maliseet communities.
- The methodology of collaborative learning is a well established concept in the Mik'maq culture. Mawikinutimatimk – coming together to learn together.
- The basis of the project is easily transferable from one cultural group to the next.

Show Me Your Math!

Drum Making –A Mathematical Perspective on a Traditional Activity

- Students explored the concepts of mathematical symmetry, measurement and geometry while constructing a drum from traditional materials.
- Traditional beliefs were reinforced through the activity, such as the importance of maintaining balance to achieve harmony.
- Students presented their work as an entry to the 'Show Me Your Math' Contest in 2007.

Conclusion

- ⦿ Its quite evident that to overcoming any issues of social and cultural learning in mathematics will have to come from us.
- ⦿ Educating ourselves in the issues of socioeconomic status, language and ethnomathematics is the key.
- ⦿ Following the 6 Attributes to an Equatable Classroom is also a must.

Attributes to an Equitable Classroom

- ⦿ Equal Access
- ⦿ Connected Learning
- ⦿ Collaborative Methods
- ⦿ Supportive Environment
- ⦿ Intellectual Quality
- ⦿ Respect for Difference

Equal Access

- ⦿ Allowing students to have access to classrooms, resources and materials needed.
- ⦿ Implying the thinking that no one is to be left out or marginalized in the classroom.

Connected Learning

- ⦿ Building on previous learning and knowledge done by the student.
- ⦿ Connect the material to be learned to other relevant social, cultural and political “things” so that it empowers the student to want to learn.

Collaborative Methods

- ① Understanding that the importance of social interaction and discussion that can help students to learn mathematics better.
- ① Allows for the students to see that their collaborative tasks and practices are valued.
- ① Gives way for students to share their knowledge to explain their thinking.

Supportive Environments

- ⦿ Allows the student to be in a classroom where they feel safe from abuse and can be respected for their knowledge.
- ⦿ Can make their expectations known and can model and scaffold mathematical thinking in the classroom.

Intellectual Quality

- ⦿ Engage students to have meaningful mathematical thinking with other students.
- ⦿ Students feel empowered through the mathematical skills, concepts and ideas they learn.
- ⦿ Students can effectively apply this empowerment towards their community

Respect for Difference

- ⦿ Materials, tasks, and problems should be free of gender and cultural bias in the classroom.
- ⦿ Teaches students to be respectful of other students and their needs