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MULTICULTURAL/ANTIBIAS MATH AND SCIENCE FOR YOUNG CHILDREN

by

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"In discussions about celebrating diversity, it is sometimes preferable to interchange the term multicultural awareness with words antibias or inclusion." Evelyn A., Petersen (1996)

In many instances science and math is taught focusing on memorization of terms and concepts, without allowing for exploration. Although, much progress has been made in the way in which we teach math and science and "new" curriculum focus on hands-on activities, the use of multicultural materials adds a new dimension to the educational experience. The use of multicultural materials when teaching mathematics and science can create a more personal and exciting experience for all students.

If we follow a constructivist approach, children should be allowed to interact with the multicultural materials, to discover on their own and to come up with explanations and hypothesis to situations and events. The role of the teacher is to serve as a facilitator, motivator, guide, and to allow and take into consideration the students input in identifying problems and solutions. Based on Vygotsky's theory this type of teaching approach and collaboration between the teacher and the learner (scaffolding) fosters cognitive growth and increases the child's performance (Berk and Winsler, 1995).

I order to scaffold the child's learning, it is necessary to begin by assessing the learner's level of understanding based on his/her past experiences. These past experiences will be greatly determined by the family's socio-cultural background and culture. It has also been documented that children learn best if we connect the new knowledge (math and science) that is being taught to them to information (multicultural materials) and situations with which they are familiar.

Materials and situations that are representative of the child's home culture will facilitate the child's understanding of the new information. It will also motivate the child to explore and research into new areas. The new material will have more meaning and relevance to his/her world. "When we use cultural objects and examples familiar to students we help them connect their home learning to school learning." (Barba, 1998, p. 19) In terms of the emotional development and sense of self the use of materials that relate to each child's culture will send the message that all cultures are welcome and that each child's family history is valued by the schools.

Schools' validation of the diverse cultural values that the students bring from home is a process that needs to begin in early childhood education. The message that the children receive early in their school years many times are the ones that will permeate during and mold their level of performance throughout their lives. Rather than seeing these cultural differences as deficiencies it is important to see them as enriching opportunities, or at the very least as challenging situations in which we can incorporate the values and culture of the children into the required math and science curriculum. The incorporation of the different home cultures into the school curriculum should be seen as valuable educational resources. The students that come from diverse cultural backgrounds have constructed their knowledge in a different socio-cultural context than students that come from mainstreamed households. These students "bring added resources to the classroom." (Barba, 1998, p.13)

National Council of Teachers of Mathematics (NCTM) (1989)

Fundamental Concepts and Skills:

1. One –to-one correspondence = understanding that the one group has the same amount of objects as another.
2. Number sense and counting = child should be able to construct number meanings through real-world experiences and the use of physical materials.
3. Classifying = children construct logical groups by classifying materials according to some common criteria.
4. Comparing = relationship between two things or groups of things on the basis of some characteristic.
5. Shape = students should describe, model, draw and classify shapes.
6. Spatial Sense = refers to relationships (position, direction, and distance) in space and the use of space.
7. Parts and Wholes = wholes have parts; parts are fractions of the whole.
8. Language and Concept Formation = three related areas: communication: children express their ideas through physical materials, drawing pictures and diagrams; connections: connecting mathematical concepts to each other, applying math to science, and reasoning: make sense out of math.
   (Charlesworth, R. & Lind, K., 1999)

National Science Education Standards (1996) by National Academy of Science's National Research Council

Science Process Skills

Basic

1. Observing = using senses to gather information about objects and events.
2. Comparing = looking at similarities and differences in real objects.
3. Classifying = grouping and sorting according to properties as size, shape, color, and use.
4. Measuring = quantitative descriptions made by an observer through observation.
5. Communicating = communicating ideas, directions, and descriptions orally or in writing; includes pictures and journals.

Intermediate

6. Inferring = based on observation but suggests more meaning about a situation than can be directly observed.
7. Predicting = making guesses based on observations or prior knowledge.

Advanced

8. Hypothesizing = developing a statement based on observation that can be tested by experiment.
9. Defining and Controlling Variables = determining which variables in an investigation should be studied or should be controlled to conduct a controlled experiment.

(Charlesworth, R. & Lind, K. 1999)

Guidelines for Teaching Multicultural/Antibias Math and Science

1. Get to know the cultural/ethnic background of the students in your class. Familiarize yourself with their traditions, customs, beliefs, and values.
2. In developing math and science activities use themes, customs, and materials that are characteristic or prevalent in your students' cultures. In many situations the activities developed by a teacher that is aware of his/her students background are more effective than pre-developed activities.
3. Choose themes, materials and issues that are relevant to your students' lives. Gerald W. Foster (1999) in Elementary Mathematics and Science Methods, suggests the use of environmental issues. "Issues must be related to children's lives to have meaning and for real learning to occur." Children learn best when presented with issues that they encounter in their immediate environment.
4. Involve the children's families as resources for information about the cultures prevalent at home. Parents can also serve as guest speakers and help with a lesson, for example, cooking a traditional recipe.
5. As with any other aspect of education, the teaching of science and math taking into consideration the cultural background of your students will constantly evolve and will change from group to group depending on the background and experiences of your students.

Example of a Multicultural Mathematics and Science Lesson Plan

Theme: Kukui or Candlenut

Objective (Goal): After exploring the materials provided by the teacher and participating in the activity the students will be able to: a) identify the kukui or candlenut nut, b) mention where the kukui tree grows, c) provide some of the uses of the kukui nuts, d) learn the new vocabulary: leis, kukui, candlenut, Mardi Gras beads, e) describe the shape of the candlenuts compared to the Mardi Gras beads, f) compare and classify necklaces made in the Hawaiian traditional fashion and necklaces made for the New Orleans' Mardi Gras Carnival, g) count using the kukui nuts and Mardi Gras beads, h) create their own leis by stringing different beads.

Materials: kukui leis, pictures, Mardi Gras beads, straw lei

Methodology (Procedure):

Introduction: Teacher will show pictures of his travel to Hawaii in which he is wearing some type of necklace. He will ask the students if they know the name of that traditional Hawaiian necklace.

Delivery: Teacher will pull out of a bag other type of necklaces. He will ask the students if they know what the necklaces are made of. After the students answer, the teacher will explain that the necklaces are made of a nut call kukui or Candlenut. He will explain that: kukui, also called candlenut, is a large tree common in Hawaii. One or two nuts with a bony shell, shaped like an English walnut, are contained in a strong, fleshy covering about 2-inches in diameter. In ancient Hawaii, the oily kernels were dried. When strung on coconut midribs used as candles. Also as a condiment; medicinal uses; and as a black dye. The nuts are mostly jet-black or brown and take a high polish. These are made into leis worn daily by the people of the islands of Hawaii and in the mainland. The kukui is Hawaii's state tree. The students will be allowed to explore and compare the different necklaces.

Closure: Teacher will facilitate a discussion with the students about what they have just learned.

Evaluation:

The students should be able to answer the questions with an 80% accuracy (8out of 10 questions correctly).

Examples of Materials and Activities

California Desert Rocks: Ask the students to observe the rocks and to list their characteristics.

Dried gourds are used to make different musical instruments, such as maracas and guiros. Maracas can also be made using the coconut shells and wood sticks: These materials can be used to explore mathematical concepts and to study the plants/fruits from which the instruments are made.

Multi-racial faces puzzle activity can be used to teach young children (as early as three years of age) about the different individual physical characteristics depending on race.

Mexican clay bird: Ask the children if they have an idea of how or what would the bird be used for? How was it made? In finding the right ingredients and proportions to be used they could explore and learn about measuring, proportions, volume, following procedures, and directions.

Clay Vases: have the students study the different shapes and compare the vases (height, weight, diameter of base, etc.)