ETHNOMATHEMATICS: AN ALTERNATIVE APPROACH TO THE
PRACTICE OF TEACHING AND LEARNING

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INTRODUCTION

Ethnomathematics is a relatively new field of educational practice and academic research. To give you a deeper understanding and appreciation of ethnomathematics, I will focus my remarks on five major themes that will provide you with the impetus to incorporate this alternative teaching method in many of your courses. It is important to know that ethnomathematical approaches to teaching and learning are not limited to the teaching of mathematics. In its true dimension, ethnomathematics is an interdisciplinary body of knowledge.

The themes that I will address in my exposition are as follows: (a) the genesis of ethnomathematics, (b) ethnomathematics as an alternative to traditional educational practice, (c) ethnomathematics as a field of study, (d) values in the teaching and learning of mathematics, and (e) the future of the ethnomathematics movement.

THE GENESIS OF ETHNOMATHEMATICS

The ethnomathematics movement began with the formation of the International Study Group on Ethnomathematics in 1985 at a meeting of the National Council of Teachers of Mathematics (NCTM) in San Antonio, Texas under the leadership of its founder, the Brazilian mathematician and philosopher, Dr. Ubiratan D'Ambrosio.

The term ethnomathematics was first used by D'Ambrosio in many of his writings and speeches to explain the relationship that exists between cultural practices in relation to the development and use of mathematical ideas or concepts. Ethnomathematics is sometimes referred to as mathematical
anthropology or ethnomathematicology in that the field focuses on the study of the development of mathematical ideas by people of various cultures. The field of ethnomathematics also explores how cultures use mathematical principles and ideas in an effort to meet the social, political, and economical needs of a given cultural group. In the context of ethnomathematics, a culture can be defined as a group of people in terms of gender, ethnicity, profession, political ideology, trade, or geographic location.

Ethnomathematics lies at the intersection of cultural anthropology and mathematics in that this body of knowledge examines how specific cultural groups go about the tasks of classifying, ordering, counting, measuring, reasoning, inferring, modeling, ciphering, and solving problems. In fact the prefix ethno refers to the cultural identity of a group: Language, jargon, codes, values, beliefs, dress, habits, food, physical traits, and so on. Ethnomathematics is also about looking at mathematical ideas beyond the traditional white male European perspective.

Ethnomathematics does not minimize nor dismiss the important contributions made by the Europeans. The focus of ethnomathematics is to provide a serious inquiry and fair analysis of the genesis of mathematical ideas. The motivation behind this focus is that many western scholars have often ignored or dismissed the possibility of any mathematical activity by non-western cultures such as China, India, the Americas (i.e., the Inca, Maya, and Aztec empires), the Arab-Islamic countries,
and Africa. The formal development of ethnomathematics has been slow because of the pervasive view that mathematical thought is somehow free from cultural as well as human concerns.

ETHNOMATHEMATICS AS AN ALTERNATIVE TO TRADITIONAL EDUCATIONAL PRACTICE

Traditional educational practice has, in my opinion, been characterized by beliefs, customs, precedent, dogma or the handing down of doctrines. I believe that the traditional practice of teaching is often driven by educational training alone. This traditional approach is what I refer to as the Mechanic-Static Model of Teaching. An alternative to this traditional model is the Organic-Dynamic Model of Teaching which is characterized by intuition, judgement, and creativity. This model of teaching is driven by educational training in concert with alternative methods, ability, and willingness. The Mechanic-Static Model of Teaching is strictly suitable for the lecture method whereas the Organic-Dynamic Model of Teaching is suitable for methods that go beyond the lecture such as cooperative learning as well as multicultural and global perspectives to teaching and learning. This model is also suitable for the teaching of adult learners in that this type of learner brings a wealth of practical experience into the classroom. These experiences function as a filter in the learning process in that these learners are active participants who are likely to desire knowledge of how the instruction relates to their own trade, profession, experience, or social concern.
Ethnomathematics as an alternative to the traditional practice of teaching is liberatory and emancipatory in nature because the instruction is inclusive and sensitive to the social and cultural needs of the learner. This approach challenges the traditional myths of teaching and learning as identified by the world renowned Brazilian educator and philosopher Paulo Freire. He argues that oppressive education adheres to the following precepts:

1. The instructor teaches and the students are taught;
2. The instructor knows everything and the students know nothing;
3. The instructor thinks and the students are thought about;
4. The instructor lectures and the students listen—meekly;
5. The instructor chooses the curriculum content and the students—who are not consulted—adapt to it; and
6. The instructor is the subject of the learning process, while the students are mere objects.

Ethnomathematics as an alternative to traditional educational practice encourages open dialogue in that the instructor is a guide rather than the only authority. In other words, the instructor is no longer the-one-who-teaches, but rather the one who is himself taught in dialogue with the students, who in turn while being taught also teach.

ETHNOMATHEMATICS AS A FIELD OF STUDY

Mathematics is a construct of the human mind and a product of society. Mathematical ideas arise out of activities and
concerns about the world. Some of these activities can be classified as counting, measuring, locating, designing, playing, coding, de-coding, and explaining. In a broader sense, the field of ethnomathematics is much more than a body of knowledge that comprises the relationship between cultural anthropology and mathematics. The study of ethnomathematics is the discourse and interplay of concepts from the fields of mathematics, mathematics education, cultural anthropology, sociology, psychology, political science, and education.

Knowledge in general, and mathematical knowledge in particular, is developed by cultures. Ethnomathematics examines, analyzes, and seeks understanding of what happens to the knowledge of one culture when it comes in contact with another culture. Sometimes cultures meet and pass on, sometimes cultures meet and there is technology transfer, sometimes one culture is absorbed by another more influential culture, and sometimes cultures engage in rivalry thereby imposing one on the other through trade, colonialism, conquest, imperialism, or war.

I believe that sometimes certain knowledge or ideas are known to both cultures, but history is written by the victorious about the canonical or officially authorized version and unfortunately the ideas of other cultures are simply ignored or at best only become a footnote in the annals of history.

The underlying structure of inquiry in ethnomathematical research contemplates the following general questions:

1. How are ad hoc practices and solutions to problems developed into methods?
2. How are methods developed into theories?
3. How are theories developed into scientific invention?

In relation to teaching and learning in general, and to mathematics education in particular, ethnomathematics focuses on a structure of inquiry that is driven by alternative pedagogical and andragogical themes. Some of these themes include the following:

1. How to integrate a sociocultural context in teaching;
2. How to develop problem solving skills in students;
3. How to improve intermediate algebra teaching and learning in the community college system;
4. How to distinguish between important curriculum content and essential or critical curriculum content;
5. How to incorporate into the curriculum, proto-mathematics or rhetorical mathematics which is defined as the use, practice, and development of mathematical ideas within the tradition or context of a particular cultural group or region such as China, Africa, India, or the Americas.

VALUES IN THE TEACHING AND LEARNING OF MATHEMATICS

The values in the teaching of mathematics or any other subject for that matter are rooted in assumption that teaching is a cultural exchange. The beauty of a subject matter in general, and of mathematics in particular is to be appreciated and enjoyed, not taught and learned. The teaching and learning of mathematics for its aesthetic value is something that is acquired by students in many different ways, and in many different circumstances that are often unexpected. This beauty is the
result of appreciation, sensibility, and ultimately, of diverse emotional states and experiences.

According to the founding father of the ethnomathematics movement, Dr. Ubiratan D'Ambrosio, there are five values associated with the process of teaching and learning. These educational values are categorized as follows:

1. Utilitarian Values;
2. Cultural Values;
3. Formative Values;
4. Sociological Values; and
5. Aesthetic Values.

D'Ambrosio points out that these values are dependent upon curriculum objectives, content, and methodology.

Utilitarian values encompass such things as modeling, formulation of problems, mathematics of natural phenomena, economics, conflict situations or game theory, and technology. The cultural values include mathematical anthropology, ethnomathematics, social and political history of mathematics, and epistemology or the nature of mathematics. The formative values, on the other hand, include mathematical games, numerical series, prime numbers, and deductive reasoning. The formative values of teaching and learning from an ethnomathematical perspective are rooted in reasoning and/or critical thinking skills. In contrast, the sociological values are comprised of comparative history of mathematics coupled with the sociology of mathematics including institutions or schools of thought. Finally, the aesthetic values of teaching and learning are based-
-in my opinion--on the sacred or mystical aspects of mathematics such as proofs and the derivation and/or justification of results. D'Ambrosio argues that the aesthetic values include astronomy and art history. If one thinks about these values it is plausible to conclude that these values are, in many ways, similar to the education of a liberal man in ancient times which consisted of the trivium and the quadrivium, that is, the seven liberal arts and sciences: Grammar, rhetoric, logic, arithmetic, geometry, music, and astronomy.

Finally, I believe that these values will benefit the traditional as well as the non-traditional learner by investing them with intellectual tools, facilitating their socialization, and giving them knowledge as a base so that they themselves can create knowledge.

THE FUTURE OF THE ETHNOMATHEMATICS MOVEMENT

The future of the ethnomathematics movement will depend on the International Study Group on Ethnomathematics, its supporters, researchers, and practitioners alike. The challenge will be to continue to disseminate knowledge, conduct applied as well as theoretical research in ethnomathematics, and to practice the principles of this broad field in the teaching profession. There are already a number of graduate and teacher training programs throughout the United States and abroad that focus on the study of ethnomathematics. The number of master's degree thesis and doctoral dissertations in this field is expected to increase. The biggest challenge for the future of ethnomathematics is to target schools, community colleges, and
universities to include ethnomathematical thinking in their course offerings, staff development, and research programs. Ethnomathematicians respect the natural talents, knowledge, skills, techniques, tools, and power of persons in every identifiable cultural group so that they too will feel challenged to advance the mathematical knowledge of the cultural group.

The field of ethnomathematics both as an area of academic research and as a teaching alternative is in its infancy. Ethnomathematics was born out of a collection of experiences, reflections, hopes, and failures that we as practitioners of education share. I invite you to embrace the concepts of ethnomathematics that may be applicable to your field of expertise and to join me in the struggle to provide a better education for the leaders of tomorrow. I say this with the caveat that there can be no progress without struggle.