Ethnomathematics and Mathematical Education

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Abstract: From the epistemic point of view, mathematics has various aspects and the term ethnomathematics is the most suitable to express this diversity. Ethnomathematics may be defined as:

a) Prototypical activities that take place within a given group and have elements in common such as counting, representing the space, establishing and symbolising relations, reasoning, inferring, etc. These activities give the members of the group an insight of the environment in which they live and the ways of interacting with other human beings.

b) A method for interpreting or thinking within a culture and a microulture whose members relate to each other by using a common method of communication. This method is influenced by physical, social and temporal elements that affect and render possible the existence and ability to think of those who share a similar background.

If mathematics is the accepted or prototypical activities of a group of scientists called mathematicians, then ethnomathematics could be defined as a discipline that comprises mathematics. There may be conflicts if a social group rejects the others and assumes the role of authority of mathematical knowledge. However, the debate should lead to the consolidation of a diverse and enriching point of view in a global future where mathematics need to be adapted to the peculiarities of every different culture.

Every social group has implicit ways and explicit methods to acquire a culture. This is also the case in ethnomathematics.

There are many signs in history that reveal a transformation in the enculturation process. This change may be related to politics, the family or society. Although the mathematical enculturation process has not been studied in depth from the ethnomathematical point of view, we think it largely depends on the characteristics of the environment where it takes place. However, some of the aspects of a particular environment may be shared by all cultures.

I have called ethnodidactics the implementation of the different methods of current mathematics enculturation and the study of these methods in the environment where they take place (i.e. official and unofficial mathematics curricula; geographical, political, social and economic elements or conditions; the instructors, their professional attitude and their education, etc.) Ethnodidactics also includes the study of different forms of evaluation, the beliefs about education – or guided enculturation – and its goals. It might be concluded that equity is possible as far as mathematical enculturation is concerned. However, equity depends on the conditions of every different social environment.

Finally, I have established a relation between ethnomathematics and ethnodidactics, by assessment of certain aspects of the professional knowledge acquired by education students. In order to do this I have drawn on an application of L.A. Zadeh’s Fuzzy Theory.

Kurzreferat: Ethnomathematik und mathematische Bildung. Von einem epistemischen Gesichtspunkt aus gesehen umfaßt Mathematik verschiedene Aspekte und der Begriff Ethnomathematik ist am ehesten dazu geeignet, diese Vielfalt auszudrücken. Ethnomathematik kann wie folgt definiert werden:


b) Eine Methode des Interpretierens oder Denkens in einer Kultur oder Mikrokultur, deren Mitglieder durch eine gemeinsame Kommunikationsmethode in Beziehung zueinander stehen. Diese Methode wird durch natürliche, soziale und zeitliche Elemente beeinflußt, die wiederum die Existenz und Fähigkeit der, die einen gemeinsamen Hintergrund haben, berühren und ermöglichen.


Jede soziale Gruppe hat implizite Wege und explizite Methoden, eine Kultur anzunehmen. Das ist ebenso der Fall in der Ethnomathematik.

Es gibt in der Geschichte viele Anzeichen für eine Veränderung im Enkulturationsprozeß. Dieser Wandel mag mit Politik, Familie oder Gesellschaft in Beziehung stehen. Obwohl die mathematische Enkulturationsprozeß nicht eingehender von einem ethnomathematischen Standpunkt her untersucht worden ist, denken wir, daß er wesentlich von den Merkmalen der Umgebung, in

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welcher er stattfindet, abhängt. Einige Aspekte einer bestimmten Umgebung können jedoch allen Kulturen gemeinsam sein.


ZDM-Classification: E20, D20

1. Ethnomathematics. Trying to explain it

Explaining the entire meaning of ethnomathematics is a difficult task for me. Not because of doubts or ignorance, but because of the difficulty that is implied in making an exposition or giving an explanation with words taken from other theories, from a point of view that includes conceptions of the world, of knowledge, of the cultures and the manifestations that can be called mathematics, which altogether make up a different local theory to explain the complete human tasks and its mathematical reflection. This is like a vital beaming, which can be grasped by the eyes, but the necessary words to explain it have not been created yet.

Each trial to explain it entails an increase of comprehension and the designation of a richer and more solid meaning. That is why I will try to search for explanations and words that lead to my approach of what ethnomathematics is and based on authors who share my point of view.

“ ‘Ethnosciences’ (Ethnobotany and Ethnoastronomy) are mainly a method of studying the traditional systems of knowledge and cognition. This method uses linguistics analyses to deduce classification systems and categorisation of the natural world of each culture. (...) Ethnomathematics are similar to that regarding. (...) However, in mathematics a deep philosophical debate emerges about the reality of the object of study”. (Ascher 1991, p.193)

Which external realities or which ideas inside our minds make up the mathematical framework are the questions that several epistemological trends, always under the premises of categories constructed by an Occidental culture and a sole formal science, try to answer. These presuppose some relationships, orders and structures that I consider cannot be generalised without considering each culture because they are representative of the way of thinking and behaving within a culture. Therefore, a contextual relativism defining mathematics is needed, which will lead us to ethnomathematics.

Ethnosciences have a common objective and in the various fields of ethnomathematics the common objective is: “creation and use of abstract patterns. This is the essence of mathematical ideas” (Ascher 1991, p. 194).

But patterns and uses are closely tied to rich and varied cultures which fortunately exist. This is the reason why “mathematical ideas are rich and multifaceted” (Ascher 1991, p. 185) although some constants are accepted by all cultures: “counting and arithmetic, classifying, putting in order. Ethno embraces: symbols, codes, slangs, myths and also their specific ways of reasoning and inferring” (D’Ambrosio 1985, p. 45).

Ethnomathematics is the answer to the epistemological concerns of a group of scientists, researchers and educators that share a plural conception of mathematical knowledge.

The ethnomathematical assumptions lead to a postmodern relativist movement in the field of mathematics, being a proof that this scientific field has a vivid consciousness that a part of its work object is redefining its ontological position.

Nowadays it is accepted that logic positivism has given place to relativism to explain not knowledge, but types of knowledge in plural. So that the pretended objective of universal justification of knowledge has gained contextualisation, background and verisimilitude. We have passed from “demonstration” objectives to others of “local interpretation”. We have rescued the “expertises” (savoir faire), emerging from different group tasks as “knowledge” and we have given them back their cultural, historical and linguistic roots, which in fact were never lost to them, but were disregarded and not considered valid to explain the reality from the point of view of positivism.

In this scenery, the movement of sociology of knowledge seems to leave apart mathematics. The emergence within the mathematicians and educators community of the epistemological and pluralist worries reveals that though delayed, it follows also the hermeneutic path, participating and sharing the signs of the era of modernity.

To show and debate about this mathematics, less universal than what we were “taught”, we have used our words, those of the natural languages of our native homelands. We soon have an idea of the context we are treating. Words are more than sounds and sounds are not universal either in the effects they produce on us when we think of them. Canalised by words, our mathematical knowledge becomes quite peculiar.

To separate the common and the idiosyncratic of the different types of knowledge, classifiable as mathematical, we have many works at our disposal carried out by researchers and teachers (most times both together), qualitative ethnographic techniques, which are as well part of the relativist beliefs of those who use them as tools to collect knowledge manifestations in their natural environment. These techniques are mostly created and adapted from other social research projects, and constitute a part of the contribution to the research project.

Stating these works in order to allow communication and a constructive critique, as well as the comprehension by the information receiver, has become a new objective and we are getting closer to it using both technologies in association with our own expressive means, and we hope that this congress can achieve its objective of facilitating