EDITORIAL

ETHNOMATHEMATICS: WALKING THE MYSTICAL PATH WITH PRACTICAL FEET

As editors, we would like to thank all of the authors for accepting our invitation to write for this *Special Edition on Ethnomathematics* of the *International Journal for Research in Mathematics Education* from the *Sociedade Brasileira de Educação* Matemática – SBEM (*Brazilian Society for Mathematics Education*). The work presented here represents a group of friends, of dear colleagues, indeed of our *ethnofamily*. In addition, like any good family, we do not always agree on everything. There is one thing we do agree on, however, and that is that we are all followers of Ubiratan D'Ambrosio's ideas, and have spent time trying to apply his ideas in our own very, very diverse contexts.

Over the past three decades, the amount of research, investigations, thesis, and dissertations that dealt with both the theoretical and practical aspects of ethnomathematics has expanded exponentially. At the same time, numerous articles, book chapters, and books have been written in many countries about the relation between culture, mathematics, and mathematics education. Over the same time, the early founders of ethnomathematics have developed countless new voices, who have gone on to make even more new discoveries, and offered new insights.

During these decades, studies involving ethnomathematics have been discussed and debated in a succession of local, regional, national, and international meetings, seminars, conferences, and congresses as well as in study groups around the world. Additionally, some journals in Brazil have provided their readership with special editions on ethnomathematics. We are honored to have been given the opportunity to organize the latest one as presented here.

This special edition has 24 authors from 10 countries who were invited to discuss their ideas, perspectives, and share their research on ethnomathematics. The 16 articles presented here represent Australia, Brazil, Colombia, Ghana, Greece, Nepal, Portugal, Singapore, Spain, and the United States of America.

In this special edition, we would like to highlight the importance of ideas of Brazilian mathematician and philosopher Ubiratan D'Ambrosio in relation to the development and evolution of the field of ethnomathematics. He is also one of the most important theoreticians in this field and offers encouragement, leadership, and dissemination of new ideas, concepts, and perspectives involved in ethnomathematics around the world and its applications in mathematics education.

Therefore, Ubiratan D'Ambrosio opens this special edition with an article in which he argues that all living species coalesce due to many factors not well explained, and that fact results in a hierarchy and arouse acts of violence and killing. However, in the *homo sapiens* species, this coalescence has led to killing and war. From his point of view, ethnomathematics, as a program, is a way of generating, organizing, and diffusing knowledge in cultural identified groups that offers a possibility of meeting the challenges of proposing and keeping peace.

The first section of this special edition raises the discussion regarding the epistemology of the ethnomathematics program. Renowned researchers come to recognize ethnomathematics as a science located in the confluence zone between mathematics and cultural anthropology. For example, Ferreira (1997) defines ethnomathematics as a methodological proposal with its own pedagogical action, and which is stimulated by ethnographical studies, and uses mathematical modeling as a tool to reach the educational goals of the investigated cultural group. On the other hand, Ascher (2002) highlighted the presence of the mathematics of peoples from a variety of traditional cultures by illustrating how their mathematical ideas play a vital role in diverse human endeavors. These perspectives show two of the numerous dimensions of an ethnomathematics program.

The four articles of this first section show that there are different interpretations of this program, and yet they are interrelated.

Charoula Stathopoulou and Peter Appelbaum propose alternative foundations for ethnomathematics grounded in post-colonial notions of dignity, recognition, and reconciliation by connecting these ideas to forgiveness as both critical awareness of dispossession and as refusal to allow dispossession and indignity. They also explore contradictory impulses inherent to ethnomathematics that prevent richer applications to mathematics education and preserve all forms of indignity and injustice.

In this ethnomathematical approach, Charles Carroll briefly shows the weaving practices of one family of weavers to demonstrate how a daughter was able to use the design storage system encoded by her mother in order to learn her practices of weaving. He also presents in detail the operation of the Lao handloom technology by describing how parts of this system enable the production, storage, retrieval and transfer of complex two dimensional geometric supplemental textile designs.

In her text, Cristiane Coppe presents a dialogue between ethnic and racial education that originated from her experiences during a postdoctoral research project (2014-2015) conducted at the Universidade de São Paulo and the Universidade de Lisboa. She presents data from five Centers for African-Brazilian Studies and the African Center Studies of the Universidade do Porto. The pedagogical work in these centers can be re-signified in terms of the perspective of the ethnomathematics program.

According to her point of view, Mônica Mesquita argues that an ethnomathematics posture rooted in critical ethnographic movements promotes the possibility of breaking with the mysticism surrounding inter and intra-communitarian processes. It also witnesses the dance of communitarian bodies to the beat of five rhythms: cultural identity, self-governing, corporification, identification, and multicultural racism, which are discussed in terms of transformation, emancipation, and civility.

The second section currently shows that the ethnomathematics program has an agenda that offers a broader view of mathematics, which embraces the ideas, processes, methods, and practices that are related to different cultural environments. This aspect leads to an increased evidence of cognitive processes, learning capabilities, and attitudes that may direct a learning process occurring in our classrooms, in addition, by reflecting on the social and political dimensions of ethnomathematics. Another important aspect of its agenda is to offer an important perspective for a dynamic and globalized modern

society, which recognizes that all cultures and all people develop unique methods and explanations that allow them to understand, act, and transform their own reality**.**

The four articles in this section discuss the continuing trajectory of the ethnomathematics agenda that tries to understand different worldviews in mathematics education.

Hilbert Blanco-Álvarez and María Luisa Oliveras analyze how the political dimension of ethnomathematics can be an effective tool for eurocentrism. Their thesis is that ethnomathematics is a useful tool for defending the mathematics knowledge of communities in Latin America that are facing globalization, the specialization of the sciences, colonization, official histories, and the existence of a single truth, and can be used to develop a more inclusive, pertinent, and meaningful mathematics education.

In his article, Francisco de Assis Bandeira presents his reflections related to a proposal of a curriculum reorientation in mathematics education in the light of conceptions of D'Ambrosio's ethnomathematics program. This article shows how mathematical knowledge is experienced by the students in their own community as a methodological subsidy in the teaching and learning process of school mathematics regarding the legal foundations of the National Curricular Parameters for Mathematics.

Jackeline Rodrigues Mendes and Alexandrina Monteiro discuss the relationship between school and non-school knowledge. They argue that ethnomathematics contributes to this debate by focusing on knowledge in different social practices. They prioritize discussions that arise from the articulation between ethno and language studies, especially with regard to the work in the field of mathematics education towards the dialogue in the second phase of Wittgenstein's work.

In their article, Daniel Orey and Milton Rosa offer a discussion about the development of ethnomathematics that has challenged traditional concepts of Euro-Western centered mono-representational systems of mathematics transforming it into a multi-representational system that represents mathematics as human endeavor. In their point of view, an ethnomathematics-based curriculum is grounded on the incorporation of mathematical ideas and activity that echo a diversity of cultures, particularly those that experienced oppression or exclusion from society.

The third section of this special edition shows how the research field of ethnomathematics have much to offer to mathematics education because it opposes formal school orientation that are not related to sociocultural and political aspects of mathematics. As a program, ethnomathematics seeks to understand the diverse processes of thinking and ways of explaining. It is necessary to discuss and debate interrelated innovative approaches in ethnomathematics programs, such ethnomodeling and ethnocomputing.

The three articles in section 3 discuss important characteristics of ethnomathematics related to its transformational power that help people to rethink the nature of mathematics through the studies of its innovative approaches in order to provide a better understanding of this research paradigm.

Tod Shockey and John Bear Mitchell have engaged an ethnomathematical lens to describe the construction of a Penobscot hemispherical lodge. In their article, the primary focus was on the *etic* view of the mathematics educators. Here, they consider the pedagogical implications and have attempted to contribute to ethnomathematics literature by recommending the recognition of a Native North American perspective (emic). The authors are moving from a western *etic* lens emphasizing the supposed universal called mathematics.

In their article, Milton Rosa and Daniel Orey share the use of a combination of local (emic), global (etic), and glocal (dialogical) approaches in the research area of ethnomodelling, which contributes to the acquisition of a more complete (glocal) understanding of mathematical practices developed by the members of distinct cultural groups. Ethnomodelling is the study of mathematical phenomena within a culture and it brings the cultural aspects of mathematics into mathematical modelling process.

Michael Lachney, Audrey Bennett, Jorge Appiah, and Ron Eglash present ethnocomputing as the study of the intersections between culture and computing. They consider three *modes* of modeling: 1) knowledge flow is unidirectional, researchers analyzes indigenous designs and provides a computing model, 2) knowledge flow is bidirectional with researchers bringing a technical etic (outsider) perspective and informants bringing a cultural emic (insider) perspective, and 3) knowledge flow is recursive since there are bidirectional flows nested within other bidirectional flow.

The fourth section of this special edition reveals that one of the objectives for an ethnomathematics program is learning to understand the student's own reality and create a pedagogical action in a natural manner by using a cognitive focus and a cultural basis for the curriculum. The sociocultural context of mathematics should be emphasized in the field of education because it suggests that the study of mathematics, as it is traditionally practiced in western societies, does exhibit a cultural bias. Any given mathematical idea or practice is a product of a particular culture and we are primarily concerned with the way in which mathematics is taught in schools.

The four articles in this section show how an ethnomathematics perspective in a mathematics curriculum should address cultural issues when elaborating and communicating expectations about the student attainment in order to guarantee the effectiveness and unprejudiced methods that distinguish achievements between individuals from different cultural groups.

Kay Owens highlights how the continuous line in a topological sense is significantly diverse in cultural practices, which are relatively common in Papua New Guinea, with cultural variations with each language group. In particular, it looks at the significance of the line in art, string-bag making, and in coverings. The implications for using children's home background in terms of new starting points for education are important for the new understandings of mathematics in a cultural context in this country.

In his article, Armando Aroca-Araujo has presented a description of three stages of analysis related to the ethnomathematics program. 1) the establishment of a number of people and study groups that are investigating ethnomathematics, 2) a case study that discusses learning ethnomathematics in classrooms, and 3) a reflection on some

questions regarding to ethnomathematics program. These stages are the basis for an elaboration of 12 callings to the ethnomathematicians of the world.

Ramesh Neupane and Toyanath Sharma have used *Cultural Project-Based Learning* (CPBL) to both challenge the way schooling views the sociocultural existence of the learners and tried to transform the way teachers teach mathematics in Nepal by using an ethnomathematical perspective in the curriculum. CPBL has been taken as an alternative way to empower learners by engaging them in socially and culturally authentic problems and projects in order to understand the mathematics that used to be taught in isolation.

In her essay, Mariana K. Leal Ferreira argues that drama can be used in the service of mathematics education to promote social justice and human rights. In this ethnomathematical perspective, this article presents an introduction to a promising attempt sprouting worldwide at bringing mathematics and theatre together to promote a better understanding of the ways in which mathematics can be embodied in order to empower the members of communities to make sense of the world they live in.

In order to elucidate, clarify and perhaps to facilitate new discussions about ethnomathematics, we truly hope that readers will be able to capture the authors' thoughts and concepts regarding ethnomathematics. From the authors own particular vantage points they each have done a great deal to add to the growing body of scientific discourse of this program.

As well, we would like to state at the outset here that there are other perspectives and innovative views on ethnomathematics emerging from other researchers and in other knowledge fields. We hope that future special editions will consider them as well. In this context, we would also like to emphasize that the questions, answers, comments, conceptions, and discussions made in the articles in this special edition are the authors' personal views on ethnomathematics.

We are certain that not all educators, mathematicians, and philosophers will agree upon these views and conceptions on ethnomathematics, yet we are also confident that, in some cases, the approaches and perspectives presented here may be in discordance with views of other ethnomathematicians. Thus, we are pleased that this special edition will illustrate what happens within a research field that continues to evolve and has spread itself worldwide to include a diversity of schools, colleges, universities, and local communities, in a relatively short period of time.

We have no doubt that ethnomathematics is alive, it is evolving, and as more and more research is uncovered worldwide, we also understand that it will continue this growth process. It is a research field that has not yet crystallized, and that to us is very, very exciting! As it stands currently, it seeks to document and understand widely diverse mathematical ideas, procedures, and practices of distinct cultural group members in order to empower them and value their previous knowledge. As this diversity of voices begins to speak, they have remarkably similar, yet different points of view.

From the discussions provided in the articles presented here, we conclude that mathematical knowledge as we currently experience it, is constructed by developing different processes, common to the members of all sociocultural groups that enable

them to elaborate and use abilities; and which include universal processes of *counting, locating, measuring, drawing, representing, playing, understanding, comprehending, explaining*, and *modeling.* Today, ethnomathematics investigates the roots of mathematical ideas and practices, starting from the way diverse individuals behave in different cultural groups.

In other words, many of the ethnomathematical studies as presented here identify mathematical practices that begin with the knowledge of the *others* in their own terms and rationality. To know and understand the value of the plurality of the nature of our diverse social, cultural, economic, and political realities is a necessity in order to take a firm stand against prejudices based on cultural differences, social classes, beliefs, gender, sexual orientation, ethnics, or other social, cultural, political, and individual characteristics.

The authors here have shared and debated the necessity of issues regarding mathematics education, classroom practices, and the knowledge of specific cultural groups. Ethnomathematics clearly has a role in helping us to clarify the nature of mathematical knowledge and of knowledge in general.

The authors here demonstrate that it is necessary to shift the research from *walking the mystical path* (philosophical and theoretical issues) toward *walking more with practical feet* (educational and practical issues) and that to us this strengthens the meaning of our *ethnofamily*.

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