

# For a Critical Ethnomathematics Perspective: Get off the dance floor and get on the balcony!

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## ABSTRACT

In this article, the authors discuss an analogy in which ethnomathematicians need to make a change in their research paradigm; that is, to *stop dancing for a moment and go up to the balcony*. In this perspective, researchers and educators have to leave the *dance floor* and *get on the balcony* in order to reach other academic fields and dialogue with different cultures. Thus, they may be able to learn and understand new perspectives and theories for a more profound work in ethnomathematics. In this regard, they can acquire the capacity to analyze and positively criticize their own and others' work on ethnomathematics.

**Keywords:** Ethnomathematics. Dance Floor. Balcony. Ivory Tower. Criticism. Educators.

## Para uma perspectiva crítica da Etnomatemática: saia do salão de dança e vá para o balcão!

## RESUMO

Neste artigo, os autores discutem uma analogia na qual o programa etnomatemática necessita mudar o paradigma de pesquisa, isto é, *parar de dançar e ir para o balcão*. Nesta perspectiva, os pesquisadores e educadores têm que *sair do salão de dança e ir para o balcão* para que eles possam atingir outros campos acadêmicos e dialogar com culturas diferentes. Então, talvez eles possam aprender e entender novas perspectivas e teorias para um trabalho mais aprofundado em etnomatemática. Desta forma, eles podem adquirir a capacidade de analisar e criticar positivamente o trabalho em etnomatemática realizado por outros e por eles próprios.

**Palavras-chave:** Etnomatemática. Salão de Dança. Balcão. Torre de Marfim. Criticismo, Educadores.

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## INTRODUCTION

In the opening plenary session of the Fourth International Conference on Ethnomathematics (ICEm-4) in Towson, Maryland, in July, 26<sup>th</sup>, 2010, D'Ambrosio offered an analogy about the Ivory Tower based on the work of Gromov. At the closing plenary session on July 29<sup>th</sup>, 2010, Pinxten used Gromov's analogy to state that it is necessary to leave the Ivory Tower in order to discuss the implications of ethnomathematics research as well as to debate the systematic internal criticism related to its concepts, political agenda, and social issues.

In this context, one question came to our mind:

*What exactly is the meaning of the Ivory Tower?*

In an interview with Raussen and Skau (2010), Gromov stated that the Ivory Tower is a comfortable place because it allows us, as researchers and educators, to operate within a set of environments and behaviors that make us feel comfortable because it creates a sense of security. It can be very comfortable to stay inside of the Ivory Tower, yet, because of our isolation; we cannot expand our world view. In this regard, we do not see the world with enough detail and as it truly may be. In other words, we are limited by our own environment and reality and can become and are in danger of being biased by our own ideas, concepts, practices, and theories concerning ethnomathematics as a program. This perspective allowed D'Ambrosio (2010) to warn us that we need to beware of our own limitations because "We are risking creating an Ivory Tower for Ethnomathematics, fascinated by its beauty and meaning" (p.16).

D'Ambrosio (2010) affirmed that researchers and educators need to leave the Ivory Tower to reach other academic fields and disciplines in order to dialogue with different cultures. In our point of view, it is crucial to leave the Ivory Tower so we may be able to learn and understand new perspectives and theories on ethnomathematics as well as to acquire the capacity to analyze and positively criticize our own and others' work on ethnomathematics. However, it is not easy to leave the Ivory Tower because we have established a comfort zone and we tend to stay (either consciously or unconsciously) within that zone.

Effective scientific research and that definitely goes for work in ethnomathematics, requires us to be aware of other perspectives, and to be conscious of our own limitations. This may be uncomfortable, but, in order to step outside our comfort zone, we must experiment with new and often different behaviors, environments, contexts, and realities. It requires us to interpret and experience these alternative responses that may occur within these often novel paradigms. However, this may raise our anxiety level and may engender a stress response; yet, the result can be an enhanced level of concentration and focus on ethnomathematics research.

In this context, the purpose of this article is to propose an alternative analogy in which ethnomathematicians need to make a change in their research paradigm. In so doing, it is necessary for researchers to briefly leave the *dance floor* and *climb up* to the balcony

in order to gain a wider perspective that acquires new approaches and theories regarding ethnomathematics. Standing up above a crowded room often allows for an improved view of the whole event, which favors one to acquire an alternate capacity to critically analyze their own and others' work. In our opinion, the nature of the ethnomathematics as a program implies that researchers need to leave the comfortable academic environment (*dance floor*) and go to the field (*balcony*) in order to work with marginalized and non-marginalized communities using different perspectives and subject matters beyond mathematics and mathematics education.

## THE BALCONY ANALOGY

In the ethnomathematics research field, one's chances of success depend on one's ability to accurately observe and synthesize a complex set of conflicting signs and data. For example, we must be attuned to cues about what is most important in ethnomathematical research, what is at stake for this program, who will support it, and who or what will block us from developing a solid research agenda, and listen to new voices and new research agendas. This means that we must continue to be critical regarding the implications of ethnomathematics in mathematics education. We must be able to discuss internal criticisms related to ethnomathematics and its concepts, political issues, and social implications as well as debate the necessity to shift research in ethnomathematics from theoretical issues toward educational, pedagogical, and practical issues (ROSA; OREY, 2003).

In order to do so, we are making use of another analogy in which is crucial for researchers, educators, and ethnomathematicians to *stop dancing and get on the balcony* (HEIFETZ; LINSKY, 2002). In other words, one effective strategy that may help us to make sense of often unseen undercurrents is to periodically step back from the action. We may picture this as leaving the *dance floor* where all the action is and *climbing up onto the balcony*, so that we can observe all the action at once. This is not as easy as it sounds because of the pressure to remain on the dance floor.

For example, we believe that stay on the *dance floor* means to apply modeling to simply analyze indigenous designs from a Western point of view. According to Eglash, Bennett, O' Donnell, Jennings, and Cintonino (2006), this is done by "applying the symmetry classifications from crystallography to indigenous textile patterns" (p.349). On the other hand, *go to the balcony* means to understand modeling as a process of translation and elaboration of problems and questions growing from real situations that form an image or sense of an idealized version of the *mathema* (ROSA; OREY, 2010). Eglash et al. (2006) stated that ethnomathematicians need to use *translation* in their research and investigations "to describe the process of modeling indigenous systems with a Western (i.e., mainstream, academic) mathematical representation" (p.348). In this perspective, the balcony view let us understand that even though ethnomathematics may apply some modeling techniques in its pedagogical action, it is necessary to use translation "to establish relations between the indigenous conceptual framework and the mathematics embedded in related indigenous designs,

such that the mathematics can be seen as arising from *emic*<sup>1</sup> rather than *etic*<sup>2</sup> origins” (EGLASH et al., 2006).

Meanwhile, from metaphorical space of the balcony, we can easily observe patterns and create interpretations of behavior and those within the larger ethnomathematical system (HEIFETZ; LINSKY, 2002). In so doing, we can accurately examine the dynamics, identify and interpret trends, and reach a deeper understanding of the current situation in relation to the ethnomathematics agenda and upcoming trends. While on the balcony, we develop three complementary skills regarding research on ethnomathematics:

- 1) We notice nuances in researchers and educators’ discourses and behaviors.
- 2) We find ways to interpret the data we collect.
- 3) We see where the general flow is moving towards.

The only way we can gain both a clearer view of reality and some perspective on the bigger picture of the ethnomathematics as a program is by distancing ourselves from the fray. If we want to affect what is happening in this research field, once rested and after gaining a new perspective, we return to the dance floor and discuss new approaches to this program.

In this regard, developing the ability to maintain multiple perspectives and remain curious helps us to determine actions that connect us to the experience of others and help the overall ethnomathematics research progress. We are able to tune into the current approaches and perspectives within the broader scenarios in the field of ethnomathematics as a program. In other words, according to D’Ambrosio and Rosa (2008), we must consider several possibilities about how the current situation reflects the concerns, challenges, critiques, values, and perspectives in the broader agenda of ethnomathematics for the 21<sup>st</sup> century.

## **ANALYZING SOME CRITIQUES ON ETHNOMATHEMATICS**

Since ethnomathematics is a contemporary global and pedagogical trend in mathematics education; this approach has allowed a number of mathematicians, anthropologists, researchers, and educators to criticize its research agenda (ROWLANDS; CARLSON, 2002; 2004; VITHAL; SKOVSMOSE, 1997; WEIMER, 2005).

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1 Emic constructs are accounts, descriptions, and analyses expressed in terms of the conceptual schemes and categories that are regarded as meaningful and appropriate by the members of the cultural group under study. It is in accord with the perceptions and understandings deemed appropriate by the insider’s culture.

2 Etic constructs are accounts, descriptions, and analyses expressed in terms of the conceptual schemes and categories that are regarded as meaningful and appropriate by the community of scientific observers. It is in accord with the epistemological principles deemed appropriate by science, that is, etic constructs must be precise, logical, comprehensive, replicable, falsifiable, and observer independent.

It is necessary for ethnomathematics researchers to analyze these criticisms. So they may be able to assess what is going in ethnomathematics by gaining a clearer objectivity and perspective about this program. The *balcony* analogy gives researchers the objectivity to critically analyse how both their own and others' research in ethnomathematics can contribute to: 1) solving problems that occur in different environments and contexts in society, 2) verify what issues need to be addressed in order to advance the ethnomathematical theory and practice, and 3) verify what approaches need to be changed in its agenda for the 21<sup>st</sup> century.

## **The Mathematicians' Criticism**

An important criticism from more traditional mathematicians about ethnomathematics is that they object to the application of the word *mathematics* to ethnomathematics in its etymological conception (GREENE, 2000; RAVITCH, 2005). In this regard, Bishop (2002) stated that with respect to academic objectivity, mathematics is often regarded as representing the purest form of analysis. It is often assumed to be independent of the subjectivity of the individual and rely instead on universal truths and facts. The supposedly universal facts and truths that form the foundation of mathematics are, in actuality, deeply embedded in the Western cultural tradition (BISHOP, 2002).

Similarly, Weiger (2000) argued that because of the deep disagreement to which the idea of universality and objectivity of mathematics is embedded in Western culture, there has been a great deal of resistance to the suggestion that mathematics could be regarded as a product of distinct sociocultural traditions. Many educators operate under the assumption that mathematics is acultural because it is a discipline without cultural significance. In this regard, they fail to see the connection between mathematics and culture (ROSA; OREY, 2008). According to Rowlands and Carson (2004), many traditionalist mathematicians, educators, and researchers have objected to the basic premise of recent analyses that have located what we refer to as Western or academic mathematics within a specific cultural context.

## **On the Dance Floor**

Ethnomathematics may not be considered a field of mathematics because it is a research area that did not develop abstractly and logically with proofs as in the formal tradition of academic mathematics (ROWLANDS; CARLSON, 2002; 2004; WEIMER, 2005). In this regard, there is often claim that understanding how other societies have arrived at different ways of counting, classifying, ordering, inferring, measuring, and modeling (D'AMBROSIO, 1990) are not as insightful, on objective terms, such as Isaac Newton's development of Calculus or Cantor's work on infinity (GREENE, 2000; RAVITCH, 2005). Thus, some academic mathematicians may feel that ethnomathematics is more properly only a branch of anthropology than mathematics.

According to this perspective, Ravitch (2005) argued that because of ethnomathematical ideas in the mathematics curriculum, educators no longer believe in the beauty and in the powerful principles of mathematics. In her opinion, countries that regularly outperform the United States in international standardized tests do not apply the ethnomathematical perspective in their mathematics curriculum. The criticism is that currently mathematics is being nudged into a specifically political direction by educators who advocate using mathematics as a tool to advance social justice, which relies on political and cultural relevance to guide mathematics instruction by applying an ethnomathematical perspective into the mathematics curriculum.

### **A View from the Balcony**

As ethnomathematicians, we might reply that ethnomathematics is not meant to be a branch of mathematics nor of anthropology because it combines elements of both fields, which reflects D'Ambrosio (1993) assertion that ethnomathematics is the intersection region between mathematics and cultural anthropology. On the other hand, Eglash (2006) affirmed that "cultural anthropology has always depended on acts of "translation" between emic and etic perspectives. Some of these translations have become formal subdisciplines" such as ethnobotany, ethnomedicine, archaeoastronomy [...] The subdiscipline of "ethnomathematics" is more recent and much more controversial (p.347).

This means that ethnomathematics creates something uniquely different from the traditional conceptions of the academic mathematics that was developed in the Mediterranean basin as well as from anthropology that only examines culture as a meaningful scientific concept. In this perspective, we believe that comparing an indigenous cultural group's methods of counting with Cantor's set theory is unfair and unjustified. According to the theory of ethnomathematics, a method of counting is just as valuable to the members of the cultural groups who use it as Calculus is valuable to those mathematicians, educators, and researchers who use it.

In regards to learning, teaching and using mathematics as a means toward social justice (KNIJNIK, 1998), the beauty and power of mathematics can be used as a tool for peaceful and non-aggressive behavior as easily as it can be harnessed for capitalistic excess, war and environmental destruction, as it was so often over the centuries. However, it is important to acknowledge that ethnomathematics recognizes the inherent value of all forms of mathematics and contributes to its appreciation. Ethnomathematics can be used to broaden the areas of life touched by mathematics; which is in effect, an attempt to democratize the ability to apply mathematical ideas, concepts, and practices to solve problems faced by our contemporary society.

### **The Anthropologists' Criticism**

D'Ambrosio (1990), Joseph (2000), and Powell and Frankenstein (1997) argued that the pervasive view of history of mathematics as Eurocentric and mathematics as

accultural and value-free misrepresent the evolution of modern mathematical knowledge. This perception is also reinforced by students' experiences of the mathematics is taught and experienced in school. In this context, one of the challenges faced by ethnomathematicians is the fact that they are limited by their own mathematical thinking and cultural state of mind (ROSA, 2010). In other words, it is only possible to characterize other cultural groups' state of mind in terms of one's own cultural and mathematical framework.

## **On the Dance Floor**

Using an anthropologist's perspective, most ethnomathematicians are educated from the Western tradition of academic mathematics (BROWN; COONEY; JONES; 1990). The discussions of the mathematical history, ideas, procedures, and practices of other cultural groups tend to translate or recast indigenous and non-Western mathematical concepts into the modern western framework in order to identify, understand, and comprehend these mathematical aspects according to their own cultural and mathematical framework (ROWLANDS; CARLSON, 2002; 2004).

D'Ambrosio (2008) stated that a great difficulty in the educational process is that teachers do not acknowledge the cultural background of their students. Thus it is often difficult for teachers to recognize the previous mathematical knowledge of their students because teachers' own previous experiences and knowledge are based on their parochial environment. According to this perspective, Brown, Cooney, and Jones (1990) suggested that the teachers' view of mathematics is transmitted to the students in their instruction, and this fact helps to shape students' views about the nature of mathematics.

In their critical review of ethnomathematics, both as a concept and as a pedagogical strategy, Rowlands and Carson (2002) objected to the type of ethnomathematics instruction that discounts the importance of academic, formal, and Western mathematical concepts and skills. They affirmed that "it is only through the lens of formal, academic mathematics sensitive to cultural differences that the real value of the mathematics inherent in certain cultures and societies be understood and appreciated" (ROWLANDS; CARSON, 2002, p.79-80). They also argued that ethnomathematics ultimately serves to render students unfit for many rewarding career paths in a competitive and globalized society.

## **A View from the Balcony**

Ethnomathematicians acknowledge the mathematical ideas, procedures, and practices of other cultural groups must be understood within the cultural context of that specific group (D'AMBROSIO, 1985; ROSA; OREY, 2006). The view from the balcony, allows us to analyze this characteristic of ethnomathematics that raises criticism among members of contemporary mathematical communities. According to Tieszen (1995), some claim that mathematics itself is objective and independent of humans (PUTNAM, 1979; QUINE, 1981). They believe in the *Platonic* view of mathematics, which states that mathematical entities are abstract and eternal, have no causal and

spatiotemporal properties, and are unchanging. Because mathematics is a remarkably successful discipline, both in its own right and as a tool for other sciences, Lewis (1991) stated that few of these members are willing to contradict any of the core claims of a discipline whose scientific credentials are as strong as those of mathematics. This means that mathematics is only interpreted in accordance to the modern perceptions of mathematical identity.

On the other hand, it is important to point out that some educators, mathematicians, and researchers do not support a *Platonist* paradigm in the philosophy of mathematics (FIELD, 1989; LINNEBO, 2006). For example, Wittgenstein (1922) was strongly opposed to the mathematical *Platonism* because mathematical knowledge could vary from time to time and from place to place, according to human intuition. In this point of view, mathematical theories are the description of observed or experienced phenomena constructed by human beings.

According to Rosa (2010), many researchers, mathematicians, and educators believe that current forms of mathematics are universal. This implies that mathematics can be understood by the members of any cultural group and in exactly the same way as it is currently understood. This relates back to the inherent bias among modern mathematicians towards *Platonic* philosophy of mathematics; thus underlining a sociocultural bias to the mathematics of the European and Mediterranean traditions (D'AMBROSIO, 1993). Despite the empirical archaeological, ethnographical, and ethnomathematical evidences to the contrary, the *Platonic* view of mathematics is held very strongly among many researchers, educators, and mathematicians.

## **Educators' Criticism**

Many researchers, educators, and mathematicians have claimed that ethnomathematical techniques can be used to teach mathematical knowledge in many school communities (ADAM; ALANGUI; BARTON, 2003; BISHOP, 2002; CIVIL, 2002; KNIJNIK, 2002). Using mathematical ideas, procedures, and practices developed by distinct cultural groups in order to recognize modern mathematical concepts is without a doubt, useful. However, a search for Western geometrical concepts in the mathematical practices of the cultural groups in the Amazonian basin is difficult, if not impossible. In other words, there are some similarities in relation to the geometrical forms but not regarding to the geometrical concepts. In D'Ambrosio's (2008) point of view, any attempt to model these ideas may cause distortions in their concepts.

## **On the Dance Floor**

From an educational point of view, some researchers and educational critics claim that the use of ethnomathematics to teach academic mathematics is absurd because it localizes and isolates mathematical thought and does not teach students to the *standardized* version of the modern and traditional mathematics. According to Horsthemke and Schäfer

(2006) this fact contributes to the exclusion of students' access to mathematical knowledge because ethnomathematical ideas in the mathematics curriculum contribute to the creation of a lighter school curriculum based on students' cultural backgrounds.

Similarly, Vithal and Skovsmose (1997) affirmed that in nations in which particular cultural groups were at one time politically and economically disempowered, this position has caused ethnomathematicians to be accused of ghettoizing the mathematics curriculum for minority students. They also argued that at a time when under-developing and developing countries are looking for ways of enhancing their participation in the global markets endeavors to localize the mathematics curriculum seem equally contestable. In this regard, they stated that ethnomathematical curriculum helps to perpetuate some of the attitudes and discourses that ethnomathematics opposes in its conceptualization.

According to Greene (2000), since ethnomathematics embraces non-European methods of mathematical ideas, procedures, and practices, researchers and educators fear a decline in mathematical rigor in the pedagogical instruction of this subject-matter. In this point of view, equitable economic opportunities and social justice for minority students are unlikely to be achieved by failing to ensure that they are well-versed in the dominant mathematical paradigm of the Western culture. In this regard, Weimer (2005) described ethnomathematics as *politically correct nonsense* that is corrupting and diluting the acquisition of the mathematical competency that students are able to develop during their lives.

## **A View from the Balcony**

Devaluation of the importance of the role of culture in mathematics reflects a certain cultural bias amongst some modern mathematicians, educators, and researchers and reflects a sense of exclusivity and an authoritarian bias and superiority towards one life experience and history (ROSA, 2010). Although the contributions of research in ethnomathematics may not significantly contribute to the mainstream body of work to which modern mathematicians contribute, there exists a large body of unquestionably significant contributions to the overall understanding of mathematics as a human activity. This educational aspect legitimizes the field of ethnomathematics as an alternative perspective of the overall understanding of mathematics.

On the other hand, the pedagogical role of ethnomathematics in the process of teaching and learning mathematics has been largely untapped in the current ethnomathematics research (ROSA; OREY, 2003). This may explain the absenteeism of the relevance of culture from the mathematical content and instruction. The result is that many students and teachers unquestioningly believe that no connection what so ever exists between mathematics and culture (ROSA, 2010). Failing to consider other possibilities, they believe that mathematics is acultural, that is, a discipline without cultural significance (D'AMBROSIO, 2001).

Even though Vithal and Skovsmose (1997) rejected the notion of permanently abandoning traditional Western mathematics, they suggested that it is necessary for

educators to employ culturally relevant pedagogical activities and examples to initiate minority students into the modes of thinking that are necessary to master Western mathematical knowledge. Sharing this point of view, Rowland and Carlson (2002) believed that it is important to use culturally relevant examples to teach academic mathematics, which should be used to allow students to gain access to the fundamental conversancy with traditional and non-Western mathematical knowledge.

## GETTING BACK ON THE DANCE FLOOR

Holding a range of perspectives is necessary but not sufficient. To be effective researchers and educators, we need to test our balcony interpretations with others. In other words, we need to *get back on the dance floor* and using what we have observed on the *balcony* by dialoguing with other researchers, educators, and ethnomathematicians who have different perspectives and concepts about the ethnomathematics as a program. Once we have tested our own interpretation with others and gotten their feedback, we may be able to find out if we have uncovered the challenges and critiques in relation to ethnomathematics. However, if there are still concerns about these challenges and critiques, we need to go back to the balcony again, come up with new interpretations, and test them on the dance floor. According to Heifetz and Linsky (2002, p.53), this “process must be iterative, not static”. In their opinion, “The challenge is to move back and forth between dance floor and the balcony, making interventions, observing their impact in [the ethnomathematical research], and then returning to the action” (HEIFETZ; LINSKY, 2002, p.53).

The goal of this process is to come as close as researchers can to being in both places simultaneously, as if they had one eye looking from the dance floor and one eye looking down from the balcony, watching all the ethnomathematical action. Dancers often focus on the other dancer, converse and talk as they dance. They have a sense of those in their immediate surroundings. In order to gain a larger view of the dance, they must retire to the balcony, in order to see an ethnomathematical system and patterns, and allow themselves to look at themselves as part of the overall environment.

They also must set aside their specific knowledge in this area and notice that part of themselves that others would see if they were looking down from the balcony. To be effective, researchers and educators must respond to what is happening and move back and forth from the balcony to the dance floor. Take action, step back and assess the results of the action, reassess the plan, then go to the dance floor and make the next move. In so doing, they may be able to maintain a diagnostic mindset on a changing reality in regards to the research on ethnomathematics.

## FINAL CONSIDERATIONS

In order for ethnomathematics to advance as a program and research paradigm, we must encourage researchers, educators, and ethnomathematicians to occasionally observe

emerging patterns of conversation, dialogue, and action that happen on the *dance floor*. This practice raises an awareness of how we can work together most effectively.

While most researchers, educators, and ethnomathematicians bow to the pressures used to keep on dancing as fast as they can, the others have learned to come to an understanding of the values of spending time away from the action, gaining a new perspective and insight that from a short break on the balcony brings. The operational pressures of ethnomathematics activities all point us back to the dance floor, yet because the ethnomathematical world often looks differently when observed from the balcony. We need to go there!

The next time we are in a dance floor executing some activity on ethnomathematics, it is necessary to experiment by subtly shifting our location to the balcony and make a conscious effort to notice and understand the critiques others have in relation to this program. Thus, it is paramount to ask ourselves: *What is actually going on here?* Getting on the balcony can make the difference.

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