

Ethnomathematics as an Epistemological Booster for investigating Culture and Pedagogical Experience with the Young Offender or Prison School Communities

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Abstract

This paper discusses how is interpreted the ethnomathematics program in the area of mathematics education, seeking to reflection their role for studies carried at schools installed in prison or socio-educative system from 2005 to 2012 in Brazil. The result is a part of research developed in the Course of Specialization in Methodology for Mathematics Teaching at International Faculty of Curitiba (FACINTER) and it held in agreement with the Brazilian Institute of Postgraduate and Extension (IBPEX). Research in ethnomathematics addresses mathematical knowledge, but also languages, values, knowledges, behaviors, and practices spread by cultural groups in specific environments. There are several interpretations for the ethnomathematics program, e.g., that its studies are part of ethnoscience or a history of mathematics, or that it is a developing educational theory or a paradigm. Based on the few research studies available on culture and pedagogical experience at the education in contexts of confinement, the ethnomathematics program takes a role of the epistemological booster to carry new research studies with the young offender or prison school communities. Besides, the studies analyzed point the necessity teachers to have access to the Continuing Formation so that they can contribute to the planning, execution, and evaluation of Pedagogical Political Project.

Keywords: Mathematics Education, Ethnomathematics Program, Student-inmate, Student-offender, Epistemological Booster.

1. Introduction

The concept of ethnomathematics developed in debates carried at international mathematics education events, having Ubiratan D'Ambrosio proposed, in 1977, the term "ethnomathematics." Rosa and Orey(2005) identified six important facts about the development of ethnomathematics as a research area:

- The publication of the book *Africa Counts: Number and Patterns in African Culture* by Zaslavsky (1973), which explores the history and practice of the mathematical activities of the people of Saharan Africa;
- The organization of the section *Why Teach Mathematics?*, chaired by D'Ambrosio (1976), during the Third International Congress of Mathematics Education, in Karlsruhe, Germany;
- The use of the term "ethnomathematics" by D'Ambrosio (1977) in a lecture given at the Annual Meeting of the American Association for the Advancement of Science, in Denver, United States of America;

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•The consolidation of the term “ethnomathematics” in Adelaide, Australia in 1984 with D’Ambrosio’s lecture *Socio-cultural Bases of Mathematics Education*, at the opening of Fifth International Congress of Mathematics Education;

•D’Ambrosio’s publication of the paper *Ethnomathematics and its Place in the History and Pedagogy of Mathematics* in 1985;

• Finally, in 1985, the creation of the International Study Group on Ethnomathematics (ISGEm)² and the launch of the Ethnomathematics Program.

In the book *Ethnomathematics: The Art or Technique of Explaining and Knowing*, D’Ambrosio (1998, 2006a) proposed a starting for the construction the concept of the ethnomathematics:

... The prefix *ethno* is today accepted as a very broad term that refers to the social-cultural context and therefore includes Language, jargon and codes of behavior, myths, and symbols. The derivation of *mathema* is difficult, but tends to mean to explain, to know, to understand. The suffix *tics* is derived from *techné*, and has the same root as art and technique; Thus, we could say that ethnomathematics is the art or technique of explaining, knowing, and understanding in various cultural contexts. In this concept, we approach a theory of knowledge or, as it is modernly called, a theory of cognition. (D’Ambrosio, 2006a, p. 5).

He continues by summarizing that ethnomathematics is a program that aims to explain the processes of creating, organizing, and transmitting knowledge in various cultural systems and the interactive forces that act in and between the three processes. Therefore, its focus is fundamentally holistic. (D’Ambrosio, 1998, p. 7).

Imre Lakatos influenced D’Ambrosio to describe ethnomathematics as a research program. In 2006, he commented on Lakatos’s work at the meeting of his Supervised Research Orientation Group:

To Lakatos, scientific knowledge developed in the History of Sciences by means of competing for research programs. It is what he defended when reflected on the development of some scientific theories at work titled *Falsification and the Methodology of Scientific Research Programs*. (D’Ambrosio, October 17, 2006b).

The program consists of methodological rules; some tell us which research paths must be avoided (*negative heuristics*), whereas others tell us which paths must be followed (*positive heuristics*). (Lakatos, 1979, p. 162).

He explained the characteristics of these heuristics:

The negative heuristic specifies the ‘hard core’ of the program, which is ‘irrefutable’ by the methodological decision of its protagonists; the positive heuristic consists of a partially articulated set of suggestions or hints on how to change, develop the ‘refutable variants’ of the research program, how to modify, sophisticate, the ‘refutable’ protective belt. (Lakatos, 1979, p. 165).

Laburú, Arruda & Nardi (1998) clarify that, to Lakatos, a research program is, in general terms, a methodological guideline that is responsible for decisions related to the construction and modification of theories. These are not isolated elements; rather, they belong to a program through which theories survive and continuously develop themselves.

The core of the ethnomathematics research program structured from the results of studies that adopt discussions about ethnomathematics as a theoretical reference, guarantying its strengthening in the mathematics education movement.

² Founded by math educators Gloria Gilmer, Ubiratan D’Ambrosio, Gil Cuevas, and Rick Scott, per its institutional repository at <http://isgem.rpi.edu/>.

1.1. Some interpretations on ethnomathematics program and its philosophical basis according to D'Ambrosio's conception

Domite, when asked about what is ethnomathematics, she responded: "The report below might show a challenging situation of ethnomathematics, both regarding the research and the pedagogy. I leave it up to the reader to think/make an assessment of the situation". (Monteiro, Orey & Domite, 2004, p. 18).

These authors comment that the indigenous teacher, Chitana, from the Guarani-Kayowa people – in a lecture to a group involved with the ethnomathematics studies – when asked about the nature of adding, subtracting, multiplying, among others, explained as follows:

When we ask people of our folk, e.g., how many mangoes leaves there are here,(he designed three leaves on the board, saying that we must think of them as being the same in size and color), we would say that there is one. And, if we join the three leaves, a stone and a piece of wood, how many objects do we have in all? We have three. (Chitana as cited in Monteiro et al, 2004, p. 18).

The process of counting for the Guarani-Kayowa people considers the qualitative aspect, e.g., the color and size of the objects observed to quantify them.

Figure 1 illustrates this example:



Figure 1. One leaf and three objects to the Guarani-Kayowa people.

Source: Leal-Vasquez (2012). *Programa de Pesquisa D'Ambrosiano: Impulsionador epistemológico para investigar as culturas e o trabalho pedagógico no ambiente prisional*, p. 26.

Chitana explained that the answer would give by Guarani-Kayowa people is one leaf or three objects. Thus, the addition of objects as realized by this indigenous community differ of the mathematics of school curricula. Therefore, Guarani-Kayowa community has so much in teaching about its count way, once they express a logic of own in their process.

D'Ambrosio (2006a) supplemented his ideas about the conceptual construction of ethnomathematics. In book, *Ethnomathematics: Link between Traditions and Modernity*, he exposed their interpretation on culture and its relationship with the ethno mathematics program:

Culture, which is the set of *compatibilized* behaviors and shared knowledge, includes values. In the same culture, individuals provide the same explanations and use the same material and intellectual instruments in their everyday activities. The set of these instruments is manifested in the manners, modes, abilities, arts, techniques—in the *tics* of dealing with the environment, of understanding and explaining facts and phenomena, of teaching and sharing all this, which is the *mathema* of the group, of the community, of the *ethno*. That is, it is their ethnomathematics. (D'Ambrosio, 2006a, p. 24).

D'Ambrosio (2005b) explains that different ways of knowing comprise the essence of the ethnomathematics program. Thus, he explained that ethnomathematics is not only the study of the mathematics of cultural groups. Barton (1996) presented a different conceptual proposal for the term ethnomathematics, based on D'Ambrosio and Gerdes's research program concept and the use of Ascher's mathematics ideas.

In Barton's view, "Ethnomathematics is a research programme of the way in which cultural groups understand, articulate and use the concepts and practices which we describe as mathematical, whether or not the cultural group has a concept of mathematics". (Barton, 1996, p. 214).

For him, this definition has four implications:

- (a) ethnomathematics is not a mathematical study; it is more like anthropology or history;
- (b) the definition itself depends on who is stating it, and it is culturally specific;
- (c) the practice which it describes is also culturally specific; and
- (d) ethnomathematics implies some form of relativism for mathematics(p. 215).

In contrast, Ferreira (2004) brings our attention to four perspectives about how to understand the ethnomathematics program, e.g., that his studies are part of ethnoscience or a history of mathematics, or that it is a developing educational theory or a paradigm.

Gerdes (1991) in *Ethnomathematics, Culture, Mathematics, and Education* presented another definition with ethnomathematics: "Ethnomathematics tries to study mathematics in its relation to the whole of cultural and social life" (p. 31). Besides, considering the fact those studies in ethnomathematics classified in *Mathematical Reviews* and *Zentralblatt der Mathematik* a discussion on history and biography (D'Ambrosio, 2006d), it is interesting to clarify what D'Ambrosio's think on the question: What is the philosophical basis of ethnomathematics program?

In 2006, D'Ambrosio answered this question in a meeting of his Supervised Research Orientation Group at the Pontifical Catholic University of São Paulo:

The philosophical basis of Ethnomathematics Program is what I name the ethics of diversity, in a sense set in the book *Transdisciplinarity*. The ethic of diversity based on the dialogue between respect, solidarity, and cooperation towards others, being these the philosophical basis of Ethnomathematics Program.(D'Ambrosio, 2006c, October 03).

D'Ambrosio (1997), in the book *Transdisciplinarity*, explained basic principles, such as respect for others and all their differences, solidarity with others to meet their needs for survival and transcendence, and cooperation with others for the preservation of natural and cultural heritage.

Thus, the philosophical basis of the ethnomathematics program must be considered, since its core principles guide the planning and execution of the stages of qualitative research explained by D'Ambrosio (2005b), so that the investigation in ethnomathematics address the knowledge systems. If "the matter involves human beings, the description and reconstruction of the cultural scenarios are essential" (p. 103).

For example, Santos (2008), Moreira (2009), Santos (2011) and Leão (2012) developed studies in ethnomathematics in Africa and Brazil, in different areas of research. They investigated, respectively, Ghana's tissues as a school activity with the Kente Community; construction of boats by Caiçara Traditional Community in the Bela Island; brands of the Galibi-Marworno People and its uses in the mathematics teaching, in the village of Kumarumã, study conducted with an indigenous community in the North of Brazil and mathematical strategies used by environmental police officers during the monitoring and patrolling of environmental crimes in São Paulo.

These studies were carried with members of black, riverine, indigenous communities and a group of environmental police officers, focusing on aspects of the Kente, Caiçara, Galibi-Marworno culture, and the discussion on ethnomathematics and the mathematical strategies present in the work of the environmental police.

Therefore, talking about the ethnomathematics program is not easy, because its core involves a diversity of study objects, which allows many interpretations to the studies in ethnomathematics, which I will deal in the next section.

1.2. Ferreira's interpretation on ethnomathematics program as a paradigm

Based on the discussions of D'Ambrosio, Domite, Barton, Ferreira, and Gerdes on ethnomathematics, in this topic, I will deal with Ferreira's interpretation on ethnomathematics program as a paradigm. Kuhn (1970)

addressed several meanings to term “paradigm” in *The Structure of Scientific Revolutions*.³ In one of its definitions, Kuhn says, “a paradigm is what the members of a scientific community share, and, conversely, a scientific community consists of men who share a paradigm (p. 176)”. However, for a paradigm to succeed, it must convince several initial supporters, who develop the paradigm to the point of being able to produce multiple objective arguments (Kuhn, 1970).

Considering these definitions of Kuhn (1970) on paradigm and D’Ambrosio’s (2010) conception of ethnomathematics as a research program in the Lakatosian sense, as well as the fact that the adoption of the term “program” refers to the criticism that Lakatos makes of Popper’s and Kuhn’s approaches to the development of scientific theories. Thus, it is interesting to read how D’Ambrosio presents the ethnomathematics program:

The ethnomathematics program is a research program viewing to understand the generation, the intellectual and social organization and the diffusion and transmission of human knowledge and behavior, which are accumulated and ever evolving, as a “helical cycle,” over the history of various cultures in search of satisfying the basic drives for survival and transcendence. Satisfying the drives toward survival and transcendence, which are the essence of being human and of human beings, essentially depend on coping with time and space and explaining their nature. (D’Ambrosio, 2010, p. 2).

Kuhn allows us to reflect on the “ethnomathematics program,” when he defines a paradigm as, “These I take to be universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners...” (Kuhn, 1970, p. viii).

Additionally, he explains that:

And as that goes on, if the paradigm is one destined to win its fight, the number and strength of the persuasive arguments in its favor will increase. ... Gradually the number of experiments, instruments, articles, and books based upon the paradigm will multiply ... (p. 159).

Based on these definitions and because ethnomathematics was not recognized in the area of mathematical education as an educational theory but instead as a theory in developing. Nevertheless, in Brazil, the scientific production of research in ethnomathematics has increased since 1985.

Knijnik (2004) synthesized the research in ethnomathematics developed in graduate programs from 1985 to 2002 in Brazil, focusing on five subjects: Ethnomathematics and Indigenous Education; Ethnomathematics and Urban Education; Ethnomathematics and Rural Education; Ethnomathematics, Epistemology, and History of Mathematics; and Ethnomathematics and Teacher Formation.

In this regard, Ferreira (2004) warns that there is still no wide-ranging and well-grounded definition for the term “ethnomathematics,” that is collectively accepted by researchers in the field. He discussed the paradigmatic status of ethnomathematics program in the work: *The Waimiri-Atroari People and the Ethnomathematics*. However, to attain a deeper understanding of this author’s work, it is worth beginning by considering the study conducted by Masterman (1979) on the term “paradigm” as put by Kuhn (1970).

At the International Colloquium on the Philosophy of Science held in 1965, the participants criticized Kuhn’s book for the multiple meanings that he gives to the term “paradigm,” as well as his definition of “normal science,” which was discussed by Popper (1979). Masterman (1979), who also participated in this colloquium, studied the meanings that Kuhn assigned to the term “paradigm,” addressing twenty-one definitions, which she categorized as sociological, metaphysical, and artifactual or constructed paradigms.

According to Ferreira (2004), these classifications confirm the paradigmatic status of ethnomathematics, since it simultaneously takes on the three paradigm categories that Masterman mentioned. He justifies his assertion as follows: “I believe that the three traits above support and corroborate the existence of the paradigm since it must simultaneously be: metaphysical, as a belief, sociological, as a movement accepted and recognized by the community; and artifactual, as a guidebook for research (pp. 74-5). Based on the works of D’Ambrosio, Ferreira,

³In 1960, Kuhn published the original book.

Kuhn, and Masterman as a theoretical reference, it is possible to understand the ethnomathematics research program as a paradigm, since the studies in ethnomathematics do not serve as models for reproduction from culture to another. However, it opens the possibility to be understood as a paradigm by other researchers. In this perspective, the ethnomathematics continues to be a research program, but it may be interpreted as a developing educational theory, that justifies its paradigm condition. Keeping this in mind, Ferreira (2004), based on the reflections on paradigms put forward by Kuhn (1970) and following a parallel concept, was inspired to assert ethnomathematics as a paradigm for mathematics education, whose analysis grounded on the work of Kuhn and Masterman. Therefore, it is possible to understand the ethnomathematics program also as a paradigm, because for something to be a paradigm it is necessary that the acceptance or adhesion of the members of a scientific community about it. (Kuhn, 1970).

This interpretation summarized in the organization chart:

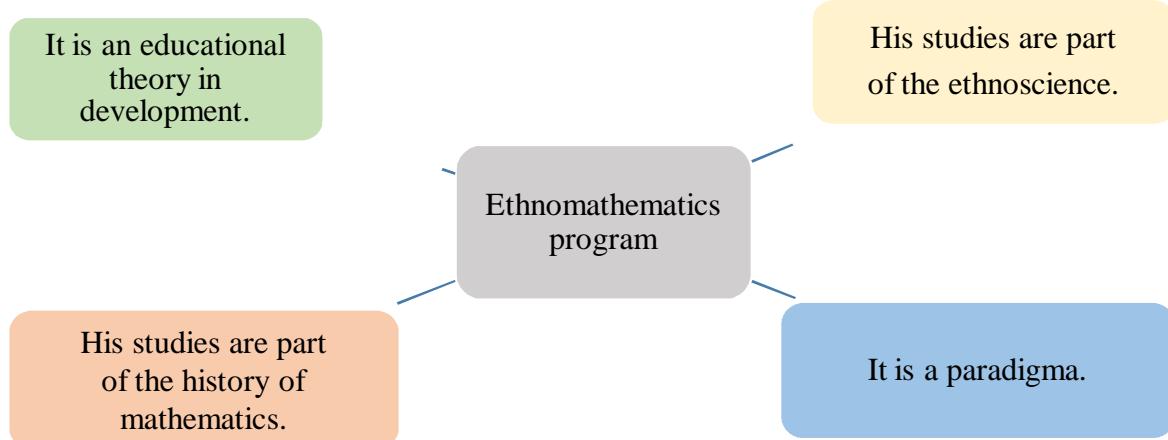


Figure 2. Interpretation on Ethnomathematics Program.

Source: Ferreira (2004). *Os Índios Waimiri-Atroari e a Etnomatemática*, pp. 70-88.

Note: Organization chart prepared by the author.

2. Materials and methods

This article is the result of research carried in the Course of Specialization in Methodology for Mathematics Teaching at International Faculty of Curitiba (FACINTER) through the Brazilian Institute of Postgraduate and Extension (IBPEX), localized in Macapá. The data collected through bibliographical research that draws upon several sources, including papers by D'Ambrosio, meeting notes from his Supervised Research Orientation Group, and papers on ethnomathematics developed in different research fields.

In short, the procedures for this study were as follows:

- 1) Survey sources on concept of ethnomathematics;
- 2) Survey studies in ethnomathematics conducted at the education contexts of confinement from 2005 to 2012, in Brazil;
- 3) Analyze the most frequent descriptive terms found in the documents selected;
- 4) Produce the monograph on theme "D'Ambrosian Research Program: Epistemological booster for investigating cultures and pedagogical work in the prison environment" (Leal-Vasquez, 2012), whose data, in part, was incorporated into this paper.

3. Result and discussion

Studies in ethnomathematics at the education contexts of confinement in Brazil involve schools installed in the penitentiary and socio-educative system. These schools offer elementary and secondary education to prison and

young offender populations. It is worth explaining that the term “education in contexts of confinement”⁴ was cited in papers by Blazich (2007), Manchado (2012), Scarfó&Aued (2011).

In Argentina, officially, this area of education recognized as Education in Contexts of the Deprivation of Freedom, as established in Article 55 of Chapter XII of Law N° 26.206 dated December 27, 2006, defined as:

The Education in Contexts of the Deprivation of Freedom is the modality of the educational system destined to guarantee the right to education for all people deprived of liberty, to promote their integral formation and full development. The exercise of this right does not allow a limitation, or any discrimination related to the situation of confinement, and will be made known to all people deprived of liberty, in a reliable way, from the moment of your entry at the institution. (Law N° 26.2006, article 55).

In contrast, in Brazil, people deprived of liberty has access to formal education through courses offered by a teaching modality called Education of Young People and Adults. This in the Article 37 of the Law N° 9394 dated December 20, 1996, designed as “those who did not have access or continuity of studies in the elementary and secondary education at the proper age,” but it is not recognized as prison education at the *Law of Directives and Bases of National Education*. (Brasil, 1996).

The table below presents the survey of papers produced in Brazil related to the focal point of this study.

Table 1 Survey interdisciplinary project or studies in ethnomathematics conducted at the education in contexts of confinement in Brazil from 2005 to 2012

Author (Year)	Title	Type of study	Advisor
Leites (2005)	Ethnomathematics and school curricula: problematizing a pedagogical experience with 5 th grade students	Master's thesis	Geysa Knijnik
Gomes (2005)	Mathematical modeling in Prison	Master's thesis	Ademir Donizeti Caldeira
Parente (2006)	Education without freedom: paths and no-paths from real-lived by a math teacher	Master's thesis	Maria Aparecida Viggiani Bicudo
Leal-Vasquez (2007)	Prison mathematics education in action: a report on body expression on the concept of family from the perspective of student-inmate	Experience report	Ubiratan D'Ambrosio
Leal-Vasquez (2008)	Captive society: between school and prison culture: a foray into penitentiary science	Master's thesis	Ubiratan D'Ambrosio
Leal-Vasquez (2012)	D'Ambrosian research program: epistemological booster for investigating cultures and pedagogical work in the prison environment	Specialization's Monograph	Sérgio Roberto Lopes

Source: Data adapted from Leal-Vasquez(2012). Programa de Pesquisa D'Ambrosiano: Impulsionador epistemológico para investigar as culturas e o trabalho pedagógico no ambiente prisional, p. 38; Leal-Vasquez (2007). Educação Matemática Penitenciária em Ação: Um relato de expressão corporal sobre o conceito de família a partir do olhar do aluno-preso, pp. 1-6.

They showed that at the education in contexts of confinement developed one interdisciplinary project and five studies on the culture of violence, mathematical modeling, pedagogical experience, prison and school culture in Brazil from 2005 to 2012, relating them with studies in ethnomathematics. These bonded to Postgraduate Programs in Mathematics Education, Education, History of Science, and to Specialization Program in

⁴This term in Spanish, according to the lay analyzed corresponds to “educación en contextos de encierro”.

Methodology for Mathematics Teaching. While the experience report refers, an interdisciplinary project realized at the São José State School. (Leites, 2005; Gomes, 2005; Parente, 2006; Leal-Vasquez, 2007, 2008, 2012).

These authors evidenced the work of math teachers that work at the schools installed in prisons or socio-educative institutions. They defended master's thesis and monograph at the University of the Sinos Valley (UNISINOS), Federal University of Paraná (UFPR), State University of São Paulo (UNESP), Pontifical Catholic University of São Paulo (PUC-SP), and at the International Faculty of Curitiba (FACINTER).

Regarding these schools, it is appropriate to remember that: University of the Sinos River Valley

The school in contexts of confinement functions as an institution within another and supposes to conjugate practices and normative frameworks between the penitentiary and educative system, with different functioning logic: in the first, punishment and disciplining based on criminal law and at the prisons; and in the second the logic of integral development of individuals, based on education. (Blazich, 2007, p. 54).

When we consider the contexts of confinement, the teaching of math in prison education is challenging. In Brazil, this theme needs to deepen at the mathematics education because the problems related to teacher formation, ethnomathematics, and teaching strategies. This discusses are necessary, because in the prison education some school materials cannot be used due to the security regulations of prison system.

The *Curricular Proposal for the Education of Youth and Adults: Mathematics, Natural Sciences, Art and Physical Education* suggests to math teachers, resources for an elaboration of teaching plans that include the problems solving, history of mathematics, math games, information technology, and communication. Besides, the document recommends the debate on mathematics and crosscutting themes in the classroom. While the *National Curricular Parameters: Mathematics* proposes the use of same resources or teaching strategies for elementary education, but also the document recommends to ethnomathematics, mathematics, citizenship and crosscutting themes, such as ethics, sexual orientation, environment, health, and cultural plurality. (Brasil, 2002, 2000).

In this last crosscutting theme, it is where studies in ethnomathematics inserted, whereby cultural plurality expressed in prison education by discussions of the problems that involving the prison school community. It is formed by "students-inmates, teachers, prison officers and other individuals, which directly or indirectly, act at some moment with the necessary administrative staff for the execution of educational assistance." (Leal-Vasquez, 2008, p. 119).

Regarding the young offenders or prison school communities, it is worth remembering that:

- The educate act of the teacher that work with youth who are fulfilling socio-educative measures, is characterized as an educative possibility that occurs when being with the other, attentively, it transcending the educate/watch situation, that denotes the lack of freedom (Parente, 2006);
- The experiences of students and teachers at a school located next to a prison involve the culture of violence; discriminations and detachments among the people that are at the penitentiary institution and those who are in their proximities (Leites, 2005);
- The school installed in prison is responsible for certifying of the formal education to students inmates, and it has a function of rescuing values, i.e., structuring the individuals for that develop an attitude of critical reflection. (Gomes, 2005);
- The coexistence of the prison and school culture, because of social relations between the teachers that work at the prison education and students-inmates or former students and the forms of multifaceted silences, e.g., silence as learning, respect imposed, subordination and refusal. (Leal-Vasquez, 2007, 2008);

Based on the studies in ethnomathematics realized on school, prison and violence culture and pedagogical experiences in the contexts of confinement from 2005 to 2012 in Brazil, the ethnomathematics program takes a role of the epistemological booster to carry new studies at the schools installed in prison or socio-educative institutions. Besides, it must consider that of prisonization⁵ is a reality for the prison community and that it somehow has implications for professionals working with them, that is:

⁵Donald Clemmer (1940; 1958) theorized the phenomenon of imprisonment in *The Prison Community*. In this book, he coined the term "prisonization" or "prisonização" to explain how different groups of inmates adapt to incarceration and his research is original for presenting the concept of prison culture. Besides, he published, in 1967, the paper "Prisonization" in *The Sociology of Punishment and Correction*, edited by Johnston, Savitz, & Wolfgang.

• The effects or universal factors of prisonization have different ways of affecting groups of inmates who comprise a prison community, like acceptance of an inferior role; accumulation of facts concerning the organization of the penitentiary institution; the adoption of local language; the development of somewhat new habits and other aspects of prison culture. (Clemmer, 1958, 1967);

• The prisonization can have a particular effect on the *personnel* that works in the prison system (Thompson, 1976).

Therefore, it is necessary to note that the research programs institutionalized in the National Counsel of Technological and Scientific Development, and Higher Education Institutions, instigate to give visibility to the issues that relate to teachers working in contexts of confinement in Brazil, like the programs that have developed studies in ethnomathematics. These investigate the cultures and pedagogical experience in public schools,⁶ which it is possible to analyze a part of local problems offive prison school communitiesand one youngoffender community.

4. Conclusions

The term “ethnomathematics”is a neologism created by Brazilian mathematician Ubiratan D’Ambrosio. He presented ethnomathematics as a research program, but his perspective has been, admittedly, transcended.

There are several interpretations for the Ethnomathematics Program, e.g., that their studies are part of ethnoscience or a history of mathematics, or that it is a developing educational theory or a paradigm. Because there are different, perspectives for what understood on the Ethnomathematics Program, the researchers that develop studies with their academic reference, they should clarify the view adopted in their works.

Researchin ethnomathematics addressesnot only mathematical knowledge but also languages, values, behaviors,knowledges, and practices that cultural groups spread inparticular environments. However, its core corresponds to systems of knowledge that are produced, transmitted and diffused by young, men and, women as part of cultures.

Based on the few research studies available in Brazil on culture and pedagogical experienceat the education in contexts of confinement, the Ethnomathematics Program takes a role of the epistemological booster to carry new research studies with the young offender and prisonschoolcommunities.In addition, the studies analyzed point the necessity teachers to have access to the ContinuingFormation, so that they can contribute to the planning, execution, and evaluation of Pedagogical Political Projectaimed to the student-inmate and student-offender.

References

- Barton, B. (1996). Making sense of ethnomathematics: Ethnomathematics is making sense. *Educational Studies in Mathematics*, 31(1-2), 201-233.doi:10.1007/BF00143932(January 19, 2017).
- Blazich, G. S. (2007). La educación en contextos de encierro.*Revista Iberoamericana de Educación*, (44), 53-60. Retrieved from <https://dialnet.unirioja.es/servlet/articulo?codigo=2372339> (January 19, 2017).
- Brasil (2000). Parâmetros Curriculares Nacionais: Matemática.[National Curricular Parameters: Mathematics] (v. 3). Brasília: Ministério da Educação/Secretaria do Ensino Fundamental.
- Brasil (2002). Proposta Curricular para Educação de Jovens e Adultos: Matemática, Ciências Naturais, Arte e Educação Física.[Curricular Proposal for the Education of Youth and Adults: Mathematics, Natural Sciences, Art and Physical Education] (v. 3). Brasília: Ministério da Educação/Secretaria do Ensino Fundamental.
- Clemmer, D. (1958). *The Prison Community*. New York: Holt, Rinehart and Winston.
- Clemmer, D. (1967). Prisonization.InJohnston, N., Savitz, L.&Wolfgang, M. E. (Eds.).*The Sociology of Punishment and Correction*(4th ed., pp. 148-151). New York: John Wiley & Sons, Inc.
- D’Ambrosio, U. (1997). *Transdisciplinaridade [Transdisciplinarity]*. São Paulo: Palas Athena.
- D’Ambrosio, U. (1998). *Ethnomathematics: The art or technique of explaining and knowing* (P. B. Scott, Trans.). Las Cruces: ISGEm. (Original work published in 1990).

⁶At Dr. Ramiro Fortes BarcelosSchool (Rio Grande do Sul), State Center for Basic Education for Young and Adults “Dr. Mario Faraco” (Paraná), João Luiz AlvesSchool belonging to the General Department of Socio-Educative Actions (Rio de Janeiro) and São José State School (Amapá).

- D'Ambrosio, U. (2005a). *Etnomatemática. Elo entre as Tradições e a Modernidade* (2^a ed., v. 1). Belo Horizonte: Autêntica.
- D'Ambrosio, U. (2005b). A prática na sala de aula. In D'Ambrosio, U. *Educação Matemática: Da teoria à prática* (12^a ed., pp. 91-108). Campinas: Papirus.
- D'Ambrosio, U. (2006a). *Ethnomathematics: Link between Traditions and Modernity*. Rotterdam/Taipei: SensePublisher. Retrieved from <https://www.sensepublishers.com/media/381-ethnomathematics.pdf>(January 19, 2017).
- D'Ambrosio, U. (2006b, October 17). Notes of the Meeting of Supervised Research Orientation Group. [Annotated by Eliane Leal Vasquez]. Pontifical Catholic University of São Paulo. São Paulo.
- D'Ambrosio, U. (2006c, October 03). Notes of the Meeting of Supervised Research Orientation Group. [Annotated by Eliane Leal Vasquez]. Pontifical Catholic University of São Paulo. São Paulo.
- D'Ambrosio, U. (2006d). Compartilhar Desafios e Propostas para a Aprendizagem Matemática na América Latina. In *Anais da VII Reunião de Didática da Matemática do Cone Sul*. Águas de Lindóia: PUC/SP.
- D'Ambrosio, U. (2010). Gaiolas epistemológicas: habitat da ciência moderna. Retrieved from <http://professorubiratandambrosio.blogspot.com.br/2010/10/gaiolas-epistemologicas-habitat-da.htm>(January 19, 2017).
- Ferreira, E. S. (2004). Os Índios Waimiri-Atroari e a Etnomatemática.[The Waimiri-Atroari Indigenous and the Ethnomathematics]. In Knijnik, G.; Wanderer, F. & Oliveira, C. J. (Orgs.). *Etnomatemática, Currículo e Formação de Professores*(pp. 70-88). Santa Cruz do Sul: EDUNISC.
- Gerdes, P. (1991). *Etnomatemática: Cultura, Matemática e Educação*. [Ethnomathematics: Culture, Mathematics, and Education]. Maputo: Instituto Superior Pedagógico.
- Gomes, M. J. T. (2005). *Modelagem Matemática no Cárcere*. [Mathematical modeling in prison]. Dissertação de Mestrado, Universidade Federal do Paraná, Paraná, Brasil. Retrieved from <http://acervodigital.ufpr.br/handle/1884/2635>(January 19, 2017).
- International Study Group on Ethnomathematics (ISGEm). Retrieved from <http://isgem.rpi.edu/>(January 13, 2017).
- Knijnik, G. (2004). Itinerários da etnomatemática: questões e desafios sobre o cultural, o social e o político na educação matemática. In Knijnik, G.; Wanderer, F. & Oliveira, C. J. (Orgs.). *Etnomatemática, Currículo e Formação de Professores*(pp. 19-38). Santa Cruz do Sul: EDUNISC.
- Kuhn, S. T. (1970). *The Structure of Scientific Revolutions* (2thed. enlarged). United States of America: The University of Chicago. Retrieved from http://projektintegracija.pravo.hr/_download/repository/Kuhn_Structure_of_Scientific_Revolutions.pdf(January 19, 2017).
- Laburú, C. E.; Arruda, S. M. & Nardi, R. (1998). Os Programas de Pesquisa de Lakatos: Uma Leitura para o entendimento da Construção do Conhecimento em Sala de Aula em Situações de Contradição e Controvérsia. *Ciência & Educação*, 5(2), 23-38. Retrieved from <http://dx.doi.org/10.1590/S1516-73131998000200003>(January 19, 2017).
- Lakatos, I. (1979). O falseamento e a metodologia dos programas de pesquisa científica. In Lakatos, I.&Musgrave, A. (Orgs.). *A Crítica e o Desenvolvimento do Conhecimento* (pp. 109-242, O. M. Cajado, Trad.).São Paulo: Cultrix/Ed. da Universidade de São Paulo.
- Leal-Vasquez, E. (2007). Educação Matemática Penitenciária em Ação: Um relato de expressão corporal sobre o conceito de família a partir do olhar do aluno-preso.[Prison mathematics education in action: a report on body expression on the concept of family from the perspective of student-inmate].In Martínez, M. & Gamboa Pérez, C. (Ed.) *Memorias de la XII Conferencia Interamericana de Educación Matemática*. Santiago de Querétaro: Édebe México. Retrieved from http://ciaem-redumate.org/ciaem/memorias/xii_ciaem/158_matematica_penitenciaria.pdf(January 19, 2017).
- Leal-Vasquez, E. (2008). *Sociedade Cativa. Entre Cultura Escolar e Cultura Prisional: Uma incursão pela ciência penitenciária*.[Captive society: between school and prison culture: a foray into penitentiary science]. Dissertação de Mestrado, Pontifícia Universidade Católica de São Paulo. São Paulo, Brasil. Retrieved from <https://sapientia.pucsp.br/handle/13381>(January 19, 2017).
- Leal-Vasquez, E. (2012). *Programa de Pesquisa D'Ambrosiano: Impulsionador epistemológico para investigar as culturas e o trabalho pedagógico no ambiente prisional*.[D'Ambrosian research program: epistemological booster for investigating cultures and pedagogical work in the prison environment]. Monografia de Especialização, Faculdade Internacional de Curitiba, Curitiba, Brasil.
- Leão, M. (2012). *Educação matemática e educação ambiental: Um estudo etnomatemático das infrações ambientais*. Dissertação de Mestrado, Universidade Estadual Paulista "Júlio de Mesquita Filho," Rio Claro, Brasil, 2012. Retrieved from

http://repositorio.unesp.br/bitstream/handle/11449/91032/leao_m_me_rcla.pdf?sequence=1, (January 19, 2017).

Lei N° 9394, promulgada na República do Brasil em 20 de dezembro de 1996. Ministério da Educação. Brasil. Retrieved from http://www.planalto.gov.br/ccivil_03/leis/L9394.htm (January 19, 2017).

Leites, C. B. (2005). *Etnomatemática e Currículo Escolar: Problematizando uma experiência pedagógica com alunos de 5^a Série.* [Ethnomathematics and school curricula: problematizing a pedagogical experience with 5th grade students]. Dissertação de Mestrado, Universidade do Vale do Rio dos Sinos, São Leopoldo, Brasil. Retrieved from www.repositorio.jesuita.org.br/bitstream/handle/UNISINOS/1886/Etnomatematica.pdf?sequence=1&isAllowed=y (January 19, 2017).

Ley N° 26206, promulgada en la República Argentina el 27 de diciembre de 2006. Ministerio de Educación. Argentina. Retrieved from http://www.me.gov.ar/doc_pdf/ley_de_educ_nac.pdf (January 19, 2017).

Manchado, M. (2012). Educación en contextos de encierro: Problemáticas, miradas e interrogantes en torno al sujeto del aprendizaje y el proceso educativo en las prisiones santafesinas. *Revista Latinoamericana de Educación Inclusiva*, 6(1), 125-142. Retrieved from <http://www.rinace.net/rlei/numeros/vol6-num1/art7.pdf> (January 19, 2017).

Mastermam, M. (1979). A Natureza de um Paradigma. In Lakatos, I. & Musgrave, A. (Orgs.). *A Crítica e o Desenvolvimento do Conhecimento*. (pp. 72-108. O. M. Cajado, Trad.). São Paulo: Cultrix/Editora da Universidade de São Paulo.

Monteiro, A.; Orey, D. C. & Domite, M. C. S. (2004). Etnomatemática: papel, valor e significado. In Ribeiro, J. P. M.; Domite, M. C. S. & Ferreira, R. (Orgs.). *Etnomatemática: Papel, Valor e Significado* (pp. 13-37). São Paulo: Zouk.

Moreira, S. M. (2009). *O Saber e o Fazer da Comunidade Tradicional Caiçara da Praia do Bonete Ilhabela*. Dissertação de Mestrado, Pontifícia Universidade Católica de São Paulo. São Paulo, Brasil. Retrieved from <https://sapientia.pucsp.br/handle/handle/13432?mode=full> (January 19, 2017).

Parente, M. G. (2006). *Educação sem Liberdade: caminhos e descaminhos do real-vivido por um professor de matemática.* [Education without freedom: paths and no-paths from real-lived by a math teacher]. Dissertação de Mestrado, Universidade Estadual Paulista “Júlio de Mesquita Filho,” São Paulo, Brasil. Retrieved from <http://repositorio.unesp.br/handle/11449/91128> (January 19, 2017).

Popper, K. (1979). A Ciência normal e seus perigos. In Lakatos, I. & Musgrave, A. (Orgs.). *A Crítica e o Desenvolvimento do Conhecimento* (pp. 63-68, O. M. Cajado, Trad.). São Paulo: Cultrix/Ed. da Universidade de São Paulo.

Rosa, M. & Orey, D. C. (2005). Las Raíces Históricas del Programa Etnomatemáticas. *Revista Latinoamericana de Investigación en Matemática Educativa*, 8(3), 363-377. Retrieved from <http://www.redalyc.org/pdf/335/33508307.pdf> (January 19, 2017).

Santos, E. C. (2008). *Os tecidos de Gana como atividade escolar: uma intervenção etnomatemática para a sala de aula*. Dissertação de Mestrado, Pontifícia Universidade Católica de São Paulo. São Paulo, Brasil. Retrieved from <https://sapientia.pucsp.br/handle/handle/11295> (January 19, 2017).

Santos, N. (2011). *Marcas Indígenas do Povo Galibi-Marworno: O despertar do ensino da matemática na escola indígena*. Monografia de Graduação, Universidade Federal do Amapá, Oiapoque, Brasil. Retrieved from <http://www2.unifap.br/nuphce/files/2015/08/TCC-Naldo-dos-Santos.pdf> (March15, 2017).

Scarfó, F. J. & Aued, V. (2013). El derecho a la educación en las cárceles: abordaje situacional. Aportes para la reflexión sobre la educación como derecho humano en contextos de la cárcel. *Revista Eletrônica de Educação*, 7(1), 88-98. Retrieved from <http://www.reveduc.ufscar.br/index.php/reveduc/article/viewFile/656/236> (January 19, 2017).

Thompson, A. F. G. (1976). *A Questão Penitenciária*. Petrópolis: Vozes.