

Challenges and possibilities in mathematics education: ethnomathematics and indigenous education in focus

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Challenges and possibilities in mathematics education: ethnomathematics and indigenous education in focus

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Abstract

The objective of this paper is to understand and analyze the development of the Course of Indigenous Teachers Formation of the State of São Paulo - MagIND, a partnership between the State Secretariat of Education and the College of Education at the University of São Paulo, FE-USP, carried out in 2002 and 2003. The indigenes who had concluded the course are apt to be teachers of Child Education and of the four initial grades of Elementary School. The teaching of mathematics was based on ethnomathematics and highlighted an awareness that there are several mathematics and that depending on the context one is more appropriate than the other prizing the construction and reconstruction of knowledge: this approach is important mainly for the differentiated education of the indigenous peoples.

The course

The Indigenous Teaching School Novo Tempo, MagIND, and the State Secretariat of Education of São Paulo managed to graduate 61 indigenous teachers, from 5 distinct ethnic groups - Kaingang, Terena, Guarani, Tupi-Guarani and Krenak - who are apt to take charge of the indigenous school and, thus, fulfill the determination of the Brazilian Constitution of 1988. The special course of indigenous teachers formation took 15 months at the CEFAMs main centers, São Paulo (Tucuruvi county), Bauru and Guarujá. The teachers graduated holding Middle Level Teaching Certificate

The organizers had the care that the knowing-doing of the indigenous teachers was taken in consideration during the process teaching-learning. The ethnomathematics was the theoretical/methodological subsidy of the MagIND course that contributed to the rescue and cultural appreciation of the indigenous groups. The area coordinator teacher used, in his lessons, unconventional strategies that stressed out the importance of the culture of these groups and that, in some way, significantly constructed and reconstructed the non-indigenous knowledge by the indigenous teachers and made them feel capable of learning, which helped to raise the self-esteem of these groups.

Why should the indigene be the one to take over the school of his village?

Because the indigenous teacher, better than any other teacher, will knowingly respect the wishes of the community, not accepting the non-indigenous knowledges – that often have no meaning for the indigenous student – as the only ones and because he knows well his community, will be able to incorporate the indigenous cultural knowledge in the classes.

"We form indigenes, why can't he (non-indigenous) teach an indigene? The indigenous school talks about the school, the mythology, many folks think it is legend, but for us, who are indigenous, it is a reality, e we convey it to the child, so the child does not forget, to tell stories, it is the universe, the sun, the moon that matters, so it is very important to work with the child. (Teacher Marcio, Terena)

"The key to finding your own mythology is to know to which society you are filiated". (Campbell, 2005, pg 23). The indigenous teacher belonging to the same community as his students, with more authority than the teacher who does not belong to the community, places the students in their local group and in their ethnic identity. The myth is good to orientate the person during his interaction with the society he belongs to, with nature and with the world. "Myths are metaphors of the spiritual potentiality of the human being, and the same powers that boost our life boost the life of the world. (idem, pg 24, 2005). The indigenous teacher is viscerally familiarized with the myths, the traditions, the rituals and the life of the village; he will be able to approach along with his students the history of their people and, better than anyone else will be able to insert it inside the official history, availing himself of the myths of the people they belong to, making the students realize the important things that have happened and are happening in their lives and that are precious to the formation of the indigene.

The indigenous myths are not stories to entertain the indigenes or other people, according to Campbell, "the great myths, like the Bible, for example, are the myths of the temple or of the great sacred rituals. They are explanatory of the rituals through which people live in harmony among themselves and with the universe. The understanding of this stories as allegorical is normal." (2005, p. 56)

Myths are fantastic human creations so they can understand their own existence. Myth is a spiritual culture that transcends all thought and brings a person to a invisible reality, favoring, thus, the communication with the mysterious invisible reality. Myth is metaphorical, symbolical and words can not translate it in its totality; the indigenes use the metaphorical resource a lot, because "there is more reality in an image than in a word." (Campbell, 2005, p. 64)

The Lévy-Brühl method, considered logical and rational, believed the reasoning of the indigene [to be] mystical and pre-logic, marked by the content of the mystical representations that were build collectively. Collective representations are based in the concrete and are complex. The author considers that in order to understand the 'primitive' thinking it is important that we try to 'get inside' the 'primitive' mentality, because the rationality of this 'primitive' thinking is built in paths that are different from the ones of the white, Christian man, taken as the measure for everyone else. Paulo Freire also shares this opinion, but aware of the limitations inherent to the attempt of getting acquainted with the culture of the other, Freire states that "you must emerge from your culture, and wet with it, see the culture of the other." (Sebastiani Ferreira, 2005, p.90)

According to Ferreira, "the imposition of the western science as the paradigm of truth, from which the intelligibility of the universe is expressed and whose concepts are used to evaluate the cognitive abilities of the 'others', has made the 'primitive mind' – 'civilized mind' dichotomy to keep on being evoked by common sense. (1992, p. 139)

The indigenous teachers that were chosen by the community studied outside the village and are immersed in a project of social responsibility. They studied – a special course for indigenous teachers towards the formation for High School Teaching Certificate – in order to transmit to the indigenous community what they received from the enveloping community. The wish of the community is to use the outside knowledge to be able to interact with the enveloping society without discrimination, prejudice and abuse. That is, to make use of the 'official' knowledges in order to be able to perform in their social contexts in a more effective way, but aware that these knowledges are not going to interfere negatively in their culture. On the other hand,

they are aware that the introduction of these new knowledges alter the reality of the village. The indigenous teacher must be prepared for the cultural growth that will occur with the exchange of knowledge between indigenes and non-indigenes. The indigenous teachers are always discussing and reflecting about the well-being of the indigenous communities, about how they will be able to contribute to the improvement of the life of the indigenous population and how to end poverty, bias, lack of land and other problems lived and felt by these people. The indigenous teacher is not indifferent to the problems faced by his community and, consequently, by his students.

When I asked indigenous teachers if a non-indigenous teacher is able to help with the education of the indigenous child, some teachers answered that they can 'but' they would have to ... By making an exception with the 'but', it is clear that they believe the indigenous teacher can be of much more help than the outside teacher, as some testimonials show:

"He can help, as long as he has the right knowledge to help the children, they have the knowledge of the indigenous people, of how to teach, of their respect to the children, how to treat them. But if means they are going to teach like they teach non-indigenous children, then it is something else, because working with indigenous children is totally different from working with non-indigenous children." (Professora Fabiana, Krenack)

For many years, the indigenes attended the non-indigene school, but according to the interviews, most of them were not advancing. According to Deusdith, "when we started the work with the indigenous population in 1997, 90% of these indigenous children didn't go beyond the third grade in elementary school. (NEI) The school model of the non-indigene does not fit the indigene, they have a different rationality, have other needs that do not suit the ones the non-indigenes have. When requesting a differentiated school, the indigenous communities are saying loud and clear that they want to learn the culture of the non-indigene – their technologies, economics, histories, mathematics, and other things. They are more open to know our culture than we are to know theirs. The indigenous teacher, at least for now, is the more [] to take over the village school for having an interest in attending the formation course to better teach the non-indigenous culture to his students, for having a greater political commitment to the indigenous communities and for intending to stay in the villages.

"What was of help was not only that they respect us, but also in us respecting them, and the duty we have too. I always wanted to be a teacher, I saw the teachers and I thought they were bossy, real authoritarian, and if it were for me to be teacher like that other one was, it was meant for me to be lousy, because sometimes, we think that only we have rights, but we have duties too, and we have respect for them, to respect the students." (Professora Fabiana, Krenack)

The indigenous teacher can educate the children in his community so they conserve and respect nature, educate them so they continue to assume the fight of their forefathers for the land, health, education, dignity and respect. According to the point of view of the teacher Sebastiane in my qualification exam, the indigenous teacher

would not be needed if he used the same methodologies of the non-indigene. "An indigene teacher only makes sense when he is capable of doing field research in his own culture. Then his formation must contemplate this: to form the indigene ethnograph of his culture." Sebastiane recognizes that this is not easy, because for eight years he has been unfolding this work with the indigenes, knowing well the difficulties.

The education of the mathematics and the ethnomathematics

For many years, the failures of the indigenes in mathematics was interpreted by the authorities (teachers, secretaries of education) as incapacity to learn the concepts, that many times created bias and the indigenes were considered lazy, handicapped etc.

According to Ferreira, the arduous learning of the written mathematics by the indigenes, "using Portuguese and the Arabic numerals in the formularization of the problems, seem to arise not only from the linguistic barrier provoked by the use of Portuguese, but also due to the conditionings to which are subjected the formal schemes of the written and non- written mathematics." (Ferreira, 1992, p. 115)

For many years the indigene learned the mathematics of the white detached from their lives and in the school of the non-indigenous. "The significance of imposing a numerical culture over peoples who did not ostensibly orient themselves by means of calculations until a few time ago is a question not yet discussed enough. To give meaning to a numerical world goes way beyond the exclusive relations between arithmetical elements." (2002, p. 43) In fact, the observations of the researcher Ferreira show that this quantitative question varies from culture to culture, with unique significations within sociocultural contexts. Every social group, in a unique way, understands and attributes an importance to quantification.

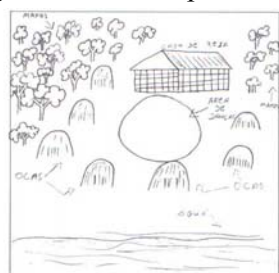
The multicultural education is the necessary direction that the educative process must follow in order to face the complexity of a world that is globalizing in an increasing rhythm. The great objective is to prevent the globalization process from leading to a homogenization, whose result is the submission and even the extinction of various cultural expressions. (D'Ambrósio, 1997, p. 63)

The indigenes need the non-indigenous mathematics in order to be strengthened and not be deceived by the non-indigenous, like in the past. Today they have their own school inside the village and, so, the indigenous teachers take care when addressing the academic mathematical contents without devaluating the mathematics of the group, to discuss the importance of the indigenous mathematics in their daily life.

Next, I want to deal with indigenous mathematical notions that appeared during the course of indigenous teacher formation, because to D'Ambrósio (1998), what makes the ethnomathematics program stand out further is trying to understand the distinct forms of knowing, of mathematizing.

According to Alves, the drawings of the indigenes representing the Xavante spatial organization demonstrate that the village is always in the center, he states that "it is a characteristic of all the cultural groups and it is a characteristic of ethnocentrism. Which in a way justifies us having the sensation that the best space is the one we are occupying." (Alves da Silva, 2005, p.82) The same can be applied to

the indigene of the State of São Paulo, when we observe the drawings created by the teachers we see that the village is the central point of their drawings¹.



ANTIGA CASA DE SÃO MARCELO,
CASA DE PAULISTA QUE SÃO OCAIS
DEBUTA NO BOM DIA - PARECE
PARAR DE INTERESSAR COM OS INDÍGENAS
TODAS AS ALGUMAS SÃO MARCELO
Josias Honório Cardoso

When visiting the Guarani village of the Jaraguá Peak, I could evidence a peculiarity regarding the localization of the school, that stood in one corner of the village outside the circle of the other houses. This has a meaning for the indigenes; since it does not belong to the indigenous culture, it is an outsider, then for them the school must be "outside" the set of houses in the community. In the following figures, one can notice that the school was represented in an isolated way, the indigenous constructions were not drawn around it.



Jaciara Jorge de Souza Gomes



Catarina Delfina dos Santos

One introduces then, an indigenous style of organizing one's space and a mathematical thinking constituted by different logics. A care that one must have is of not using the eyeglasses of the 'official' mathematics to validate the mathematics of 'the other'. In accordance with Fernandez, "the mathematical practices of the others are thus legitimated - or delegitimated - according to their greater or smaller similarity with the mathematics we learn in the academic institutions" (2004, p. 125) The 'official' mathematics has the power to determine what is or is not possible in a categorization of space, time and ordering. But when using the ethnomathematics as research theme guiding a formation course it causes one to reflect what teaching and learning is and to consider the particularities of the knowledge that are socially created and historical and politically recreated.

¹ Drawings taken from the book "Magistério Indígena Novo Tempo: um caminho do meio (proposta à interação)" São Paulo, USP/FAFE/Secretaria do Estado de São Paulo, 2003.

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