
How Do Non-indigenous and Indigenous (Mathematics) Teachers, Jointly, Contribute to the Revitalization¹ of the Native Language?²

**M. do Carmo Santos Domite,
Valéria de Carvalho**

*Universidade de São Paulo-USP,
Universidade Paulista-Unip*

This study may be understood as a set of ideas and proposals about possible directions for indigenous teacher education when the purpose is revitalization of indigenous language in general and the use and valuation of indigenous language in mathematics education in particular. Taking as a point of departure the vision and needs of indigenous Terena teachers relative to native language fluency, we worked with them in one Terena village, producing materials for learning language and mathematics. Our work focused on indigenous language classes, bilingual schooling, immersion in communal cultural practices, and the involvement of native-language-speaking elders in elementary education.

Introduction

In the last ten years, a number of research studies (e.g., Reyhner, 1990; McIvor, 2009) have been published about the cultural movement of indigenous peoples toward the revival of their native tongues as well as the means, methods, and working styles of this revitalization. Researchers argue that since the mid-twentieth century, indigenous peoples have begun to reclaim their languages and work toward their revival and use, debate some aspects of the endeavor, and discuss possible ways to revive and give a sense of continuity to indigenous languages generally.

As part of our effort to better understand the potential to revitalize the Terena language in two different Terena villages, in particular the intricacies and complexities of the mind-frames of indigenous

speakers, we worked with Terena to better understand their own comprehension of the revival and continuation of indigenous languages as well as this particular objective. We addressed learning materials in language learning, including research, language classes, other subject classes (especially mathematics), bilingual schooling, immersion practices, and early- childhood focus. We found that many questions and concerns require further investigation.

This research was grounded in the knowledge that our group acquired in the Intercultural Undergraduate Indigenous Teacher Course (FEUSP, 2005–2008), which included several extended visits to groups of different indigenous ethnicities. From that field experience we began to develop a draft of what could be called an amalgamation between the principle of an indigenous peoples' bilingual education program and an initiative to investigate related issues at a deeper, more academic level.

Our research can be justified by the Terenas' own perception, which was shared by the non-indigenous language teachers of the Intercultural Undergraduate Indigenous Course, that Terena language in São Paulo villages is seriously endangered because it is no longer being transmitted to new generations. Surely the objective of maintaining Terena indigenous language (or any other indigenous language) is especially important for maintaining a culture, as D'Ambrosio has eloquently point out:

We are interested that a tree flourishes, then we would be taking good care of its branches, but it will never be strong if its roots are not good, deep... It is useless to try straightening the things of a society if you don't give to the elements that will work in that cultural root, which will grant them strength. If you don't give it, they may be easily manipulated... You can only enter this reflection if you have deep roots and think: "I know myself and know that I am as much a human being as that other one. I know that my culture has as many accomplishments as the other's culture." (cited in Carvalho 2007, p. 264)

Background

During 2002-2003 and 2005-2008, in a partnership between the College of Education of the University of São Paulo-USP and the Secretary of Education of São Paulo, Professor Maria do Carmo Domite coordinated both the Indigenous Teacher Education Course for the Elementary Level and the Intercultural Undergraduate Indigenous Teacher Course for Elementary and Middle Schools at the College of Education of the University of São Paulo. The basic goal of these courses was to generate a proposal for learning/teaching for the elementary schools of the indigenous villages in the State of São Paulo, but to do so in such a way that those teachers could take over the village schools. Eighty indigenous teachers from five different ethnic groups (Guarani, Tupi-Guarani, Kaingang, Terena, and Krenak) living in different villages took part in this project.

We, as non-indigenous teachers, were responsible for co-planning lessons in mathematics aimed at the revival of the Krenak, Kaingang, and Terena languages—under the advice of linguists and anthropologists—as part of the bilingual perspective of the aforementioned Indigenous Education Program.

The status of fluency differed for each people indigenous languages. The Guarani, in general, and the Guarani teachers in particular are fluent. The Tupi are not as fluent, but are aware of this situation and strive for enough creativity to maintain and revive their language. Among the Terena, Krenak, and Kaingang, few adults are native speakers and there are almost none in the youngest generation. As they studied the preservation of their indigenous languages, those teachers began to systematically approach the revival and use of these languages.

In terms of native-language communication and mathematics, the course was based on understanding of indigenous ways of interpreting and enacting linguistic/mathematical relationships. Synthesizing the theorizations of literacy (Freire, 1983, 1994; Freire & Macedo, 1987), mathracy (D'Ambrosio, 1999; Skovsmose, 2001) and ethnomathematics (Barton & Alangui, 2004; D'Ambrosio, 2001; Domite, 2006) we aimed at approaching indigenous children's mathematical mind-frame by contextualizing these concepts within their native educational environments.

Specifically, we defined *literacy* as the indigenous people's capability of processing information (which included written and spoken

language as well as signs and gestures), whereas we defined *mathematicy* as the capability of dealing with codes and numbers, inferring, proposing hypotheses, drawing conclusions from data, and orienting in space. Ethnomathematics focuses on how quantitative and spatial relationships are identified by culturally differentiated groups, according to their own rationalities and in their own terminologies. Indeed, the theoretical basis we propose for the learning and teaching process in this indigenous education program comprises the understanding that:

... different mathematical relationships and practices can be generated, organized, and transmitted informally to solve immediate needs, as occurs with language. This way mathematics is incorporated into the core of the learning-by-doing processes of the community and thus mathematics is part of what we call culture. From this standpoint, ethnomathematics is concerned not only with the cultural roots of mathematical knowledge, but also quantitative and spatial relationships generated within the cultural community, which often compose mathematics as well. (D'Ambrosio & Domite, 2007, p. 201).

Research Questions

With a focus on these views of indigenous education, this study aimed to provide evidence for the following research question: In terms of our personal and professional experiences as mathematics educators with indigenous Terena teachers, which directives and possible interventions might be used to construct a contextualized proposal for indigenous language revitalization?

Method

The aim of this qualitative study was to investigate the use of certain activities in revitalizing native-language use among indigenous Terena teachers and, in turn, among their pupils. Meetings and discussions about the contents presented to the indigenous teachers had the result of allowing us to understand the emotional and intellectual

preoccupations of the participants, generate questions, and provide context for the analysis.

We gathered information about how these indigenous teachers made progress in using their native languages through a sort of action research process, the aim of an action researcher being to bring about development by analyzing existing practices, identifying elements for change. In our work, we combined two types of actions: indigenous teachers reflected on their practices and non-indigenous teacher educators investigated their support processes. First, both the indigenous Terena teachers and the non-indigenous teacher educators agreed to work on this revitalization process. Second, the act of finding evidence helped us to understand our process as researchers, not only in terms of what we proposed to do to solve these problems, but also in terms of the factors that affected what we were doing.

In order to understand how the professional development of Terena indigenous teachers can be best supported by educators from outside that culture, we felt that we must acknowledge certain conceptual problems pertaining to psycho-epistemological issues. For example, we as non-indigenous teacher educators seemed to know that we were expected to listen to and understand the problems of the indigenous teachers in light of the education of their own people (Domite, 2010, p.308).

Toward the Indigenous Village: Terena Language in Action

The experiences we describe here took place, in the Terena village of Ekeruá during three different working meetings. After our arrival at the village, we spent some time with the chieftain—who demonstrated a broad view of linguistic revival—asking him for permission to gather as many indigenous teachers as possible. Next, in collaboration with our indigenous colleagues and the chieftain, we gathered in a classroom and concocted a work plan for the three days of our stay. Having arrived with a set of suggestions, we shared these thoughts and considered them, as a group, in terms of the perspective of the local teachers.

Our informal discussion with the eight Terena teachers and their chieftain included telling them that one of the aims of this

revitalization movement for their language was to expand their education as indigenous teachers so that they could work in a bilingual context – Terena and Portuguese. Then, jointly, we tried to reach an understanding of what it means to work in a bilingual context (e.g., alphabetizing the children in native and Portuguese language, stimulating bilingual fluency, and so forth). At this point, some contradictions appeared. For example, some of the indigenous teachers wanted to emphasize indigenous-language conversation, whereas others preferred to teach reading and still others thought that the progression of listen-speak-read-write was most important.

The atmosphere on this first day was relaxed and informal, possibly because of our conscious creation of a social and affective approach. During the second encounter the teachers displayed a more involved and participatory attitude—perhaps because of the nature of the activities we proposed—arriving with a different degree of involvement, such as deciding to take a deeper and keener look at the actual requirements for the success of the linguistic revival project. The third day was invested with the importance of sharing experiences of the implementation of the proposed tasks as well as initial, general findings.

The activities we proposed in order to construct evidence that could be used for analysis were based on our concern with the development of positive attitudes on the part of the teachers as well as their relationships as learners and self-elaboration in dialogical processes which language and mathematics subjects assume a larger conceptual understanding.

The analytical perspective of the empirical activities we proposed and discussed with the indigenous teachers is theoretically supported in works concerning Freire's viewpoint—we found data and evidence in the *other's* answers and did not arrive with a fixed set of ideas about the *other*.

Investigative Activities: Arguments and Empirical Results

The indicators that made it possible to understand the variables related to our goals were obtained with two instruments: the investigative activities themselves, and dialogue with the Terena teachers. The latter was focused upon their feelings about and predisposition to

the revitalization of their own language, either by means of scholarship or by social, cultural and linguistic empowerment. The following activities were carried out.

Walking in Several Directions According to Instructions

In order to engage indigenous teachers in the process of reflecting upon their teaching and learning of geometry we encouraged them to talk about representations they perceived via the observation and representation of movements and constructions in terms of their living spaces. The proposed activities were intended to lead students to coordinate visual information taken from the world around them, including their perceptions of the body in action (displacements, constructions) and speech about their representations.

A very important finding—in terms of language and mathematics communication— during the applications of these activities was that when a Terena teacher was asked to tell a second one, in Terena Language, to turn left or right, he did not know what to say. And, during a further discussion a female Terena teacher, who was more fluent in Terena language than most of her colleagues, explained that in Terena there is no single words that mean left/right. Instead, native speakers of Terena use body language to indicate physical markers that they use to spatially orient themselves.

Similarities and Differences

In this hypothetical exercise, a student would throw a ball to another student while saying loudly, in Terena language, one similarity between them (e.g., “white T-shirt”). Then the student who had caught the ball would throw it to another one while loudly observing one similarity between them (e.g., “brown hair”). And so on.

Mental Calculations

The teachers were invited to choose, with total freedom, strategies for mental calculations in ways that would accomplish at least two goals: students' acquisition of a more autonomous relationship with their mathematics thought and student understanding of arithmetical calculations not just as an exercise in mathematical thought but also in terms of social, political, or economic situations in daily life (Domite, 1996; Skovsmose, 2001). By giving them some arithmetical calculations, we noticed that the teachers were loudly reciting different/proper calculations, using some words in Terena language but most in Portuguese.

Vocabulary Practice

Students would be prompted by the teacher to research names of different things, places, ideas and so forth, in order to bring out their natural curiosity and develop vocabulary and linguistic skills in their native tongue.

Immersion Practices

Based on the indigenous teachers' report that they were already used to meeting with students on Saturdays to play guitar and sing as well as to rehearse theatrical productions, we proposed the concept of a "Language Saturday" during which all members of the village would be motivated to practice in their native language.

Bilingual Schooling

From our knowledge of other researches, we concluded that one valid suggestion to enhance the usage of native ways of communicating among indigenous students is to split language use between the two periods in which they attend school (Bello, 2000; Reyhner, 1990).

Focus on the Children

From our observation that many adults and/or elders were Terena-language-fluent speakers, we led the indigenous teachers group to consider that the presence of village elders in the children's classrooms would be very important for cultural crossover.

Indigenous Teachers as Researchers

The native teachers were invited to raise awareness by producing research that would elucidate why their language, in their community and in their vicinity, suffers degradation and is even in danger of extinction, whose results should be made available to the all other Terena villages from São Paulo.

In summary, at the end of the three days, we decided -together with these indigenous teachers—to produce didactic materials for learning indigenous language and mathematics (mental calculation, measurements, spatial orientation, etc.) that would focus on five actions: a) involvement of native-language-speaking elders in elementary education; b) dedicated indigenous-language classes; c) bilingual schooling; d) immersion activities in communal cultural practices; and e) research by indigenous people of the reasons that so few people are speaking the native language.

Findings

The issues of language revitalization that arose in this indigenous teacher education context led us to focus our attention on three categories of analysis: a) requirements that would enable Terena indigenous teachers to be able to conveniently enact tasks related to the usage of their native language, and successful ways of doing so; b) the strenuous manner in which Terena people negotiate their relationship with the bilingual perspective of the Intercultural and Bilingual Indigenous Education Program; and, c) differences of receptivity and expectancy in terms of mathematics activities intended to improve Terena language fluency.

It is our finding, based on the different pedagogical actions and

manifestations on the part of the indigenous teachers, that when given the appropriate guidance and instruments, the parties involved experience an awakening in terms of language fluency. It seems to us that the indigenous teachers, their students, the students' parents, as well as village or community elders and, in this case, the chieftain, were thinking about the possibility of classes being taught primarily in their tongue.

We also conclude that the reversal of the imperilment of an indigenous language should not only prove to be highly feasible by teaching indigenous students, but also should prove quite effective in associating the idiosyncrasies of this manner of linguistic revival, by means of all the specific techniques that could be involved, with the particularities of the construction of knowledge of basic mathematics. More expressive forms of receptivity were noted in the activities that involved mental calculation, in that the self-capacity—autonomy—of calculating by one's own means seems to be a possibility of significant learning.

One aspect that provided a way to diminish the level of degradation of the Terena language was the attempt to recover the interest of the youth by increasing their natural curiosity about the ways of the elders by resuming the regular evening practice of sunset gatherings at the House of Prayer. This powerful practice has been, unfortunately, sidelined due to the competition provided by, for example, soap operas on TV.

In terms of what would be required for teachers to perform this reversal, the elders would have to be fully available to answer students' inquiries about the old ways, tales and general ancient knowledge. Such interactions would be mostly put into practice in the original native tongue, as a means to generate curiosity among the youngsters. We found that these initiatives generate some discrepancies. A certain perceived difference of expectations seems to have been located in the teachers' own perceptions of improving fluency, such as the extent of the lack of fluency and/or the value given of revitalizing the mother tongue.

Conclusions

At the core of our research rested the conviction that it should be not merely possible, but is in fact quite necessary, for the native groups we

advised throughout our study to develop their traditional linguistic proficiencies to a functional stage. This conviction is in accordance with the official directives provided by the educational indigenous movement in Brazil. Gradually, we noticed—perhaps due to our predispositions to learning the old ways—that this initiative not only strengthens the intergenerational bonds but also instills a sense of ancestrality in the older generations and a sense of belonging in the younger ones.

We came to realize, with a great sense of self-esteem and joy shared by our indigenous colleagues, that the more we all persevered in the proposals, discussions, exercises, and practices aimed at raising awareness of linguistic revitalization, the more names of the past emerged.

It is important to emphasize our recognition, as teacher educators foreign to this indigenous culture, the constant need to question the role and the meaning of the dominant language (Portuguese) and its consequences—which include recognizing that the Brazilian Federal government sometimes aims for assimilation and, at other times, recognizes its obligation to support Indian language preservation. Indeed, the indigenous policies in Brazil have always been a national project inside a larger one that has not taken plurality into consideration because it has contained the unspoken goal of unifying (i.e., erasing) cultural differences, which does not attribute value to linguistic diversity and indigenous knowledge.

Finally, from the perspective of (mathematics) indigenous teacher education, we were unsure about how we could apply mathematics activities in order to transform the indigenous language revitalization process. In other words, the value of orienting teachers to motivate fluency in Terena language among their students, whether the activities involved concerned mathematics, arts, or other fields of knowledge, remained unclear—as did the actual roles to be played by these teachers. It seemed to us that the focus of teacher education in terms of the revitalization of the Terena language must be upon problematizing the processes by which the cultural knowledge of the teacher educators as well as of the indigenous teachers themselves become the heart of instruction.

The factor that gained the most clarity was the transformation of the way of being, as a learner, a member of the Terena people during this teacher education process. We perceived this growing clarity as the indigenous teachers posed questions and as we, as teacher

educators, questioned them. The questions of the Terena indigenous teachers about their fluency in their own language became significantly more solid. In fact, they began to problematize their own ways of thinking about these linguistic cultural dynamics during the course of our meetings.

Notes

1. To understand the terms *revitalization* and *revival*, as well as to be able to choose the appropriate set of instruments to implement such initiatives, one must carefully assess the current state of these languages. A language that has no native speakers is called dead/extinct. A language that has no native speakers in the youngest generation is called moribund and the one that have few native speakers is called endangered/imperiled.

2. A very similar paper has been already accepted by Revista Internacional de Educación para la Justicia Social (RIEJS) (Universidad Autónoma de Madrid), which gave us permission to send it to MES8.

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