MATHEMATICS EDUCATION AND QUILOMBOLA EDUCATION: REFLECTIONS BY TEACHERS ON THE CHALLENGES TO ETHNIC-RACIAL EQUITY

EDUCAÇÃO MATEMÁTICA E EDUCAÇÃO QUILOMBOLA: REFLEXÕES DE PROFESSORAS SOBRE OS DESAFIOS PARA EQUIDADE ÉTNICO-RACIAL

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ABSTRACT

Although the majority of the Brazilian population is comprised of Afro-Brazilians, prejudice situations against them are common, even in school situations. Fifteen years ago the federal government published National Curricular Guidelines for Quilombola School Education in remnant communities of former slaves. This article aims to discuss aspects of the challenges in developing a mathematics education that promotes ethnic-racial equity. We present elements from a field study with a group of quilombola school teachers. The results indicate that the inclusion of strategies to rescue African mathematics knowledge faces resistance and prejudice from teachers, students and families. Studies that investigate the processes of teaching and learning Mathematics by Afro-Brazilians may contribute to make these discriminations visible.

Keywords: Education; Quilombola Education; Racial Prejudice in School; African mathematics; Afroethonomathematics.

RESUMO

Apesar da maioria da população brasileira ser constituída por negros ou pardos, o preconceito contra as pessoas e cultura afrodescendentes é cotidiano, inclusive em situações escolares. Há 15 anos o governo federal oficializou a educação quilombola em

comunidades remanescentes de africanos escravizados. Este artigo tem como objetivo discutir aspectos dos desafios em desenvolver uma Educação Matemática que promova a equidade étnico-racial. São apresentados elementos de um estudo de campo com um grupo de professoras de uma escola quilombola. Os resultados indicam que a inclusão de estratégias de resgate da matemática africana enfrenta resistências e preconceitos dos próprios professores, alunos e famílias. Estudos que investiguem os processos de ensino e aprendizagem de Matemática por afro-brasileiros poderão contribuir para visibilizar essas discriminações.

Palavras-chave: Educação Matemática; Educação Quilombola; Preconceito Racial na Escola; matemática africana; Afroetnomatemática.

1. Introduction

The notion of race and the need for classifications arose and were used to colonize, enslave, segregate, sterilize, and persecute millions of people (Zamora, 2012). Brazil had African slavery as official policy for centuries, which still has repercussions for the devaluation of Afro-descendants, generating enormous disadvantages in social, political and economic relations for this population.

Data from the latest demographic census indicate that together, blacks and mixed race represent more than 50% of Brazilians (Brazil, 2014). Although they represent the majority of Brazilians, this population suffers daily due to practices of racism in diverse social situations, including in school contexts.

Silva and Powell (2016) argue that some of these racist actions can be characterized as micro-aggressions, as they constitute verbal, nonverbal, and visual insults directed at individuals on the basis of race. These types of racial attacks are "often done automatically or unconsciously by aggressors, but are capable of causing a profound impact on the life of those who are attacked"(p. 45). Thus, despite having very destructive effects, many situations of racial prejudice suffered by millions of students are invisible.

Pereira (2011) investigated racial prejudice and mathematics teaching in a public school that had inaccurate statistical information on the students´ Afrodescendent origin. The pedagogical department of the school affirmed that 90% of the students were Afrodescendants; according to the parents' statement, this index reached 40%. In his study, Pereira applied a questionnaire with 100 students from the 6th, 7th and 8th years. The results indicated that 80% considered themselves black, Afro-Brazilian or brown. Despite this high percentage of student who self-recognize as afro-descendants, 65% of the respondents mentioned that they did not consider blacks intelligent. The daily existence of practices of discrimination against Afro-descendants, and often against themselves, makes urgent the need for measures that promote education for ethnic-racial relations.

Pereira (2011) investigated racial prejudice and mathematics teaching in a public school in which statistical information on the Afrodescendent origin of students was unacurate. The pedagogical department of the school affirmed that 90% of the students were Afrodescendants; according to the parents' statement, it reached a percentage of 40%. In his study, Pereira applied a questionnaire with 100 students from the 6th, 7th and 8th years. The results indicated that 80% considered themselves black, Afro-descendant or

brown. Despite this high percentage of self-respondents, 65% of the respondents mentioned that they did not consider blacks intelligent. The daily existence of practices of discrimination against Afro-descendants, and often against themselves, makes urgent the need for measures that promote education for ethnic-racial relations.

In Brazil, until the complete legal abolition of slavery in 1889, the quilombos were social organizations of resistance of the blacks. Depending on the reading of history, different meanings can be attributed to the term quilombo and quilombolas (also called moroons or cimarrones in other parts of Latin America). Thus, quilombolas can be considered as "fugitive slaves", but can also be seen as people who lived in fraternity, freedom and solidarity (Arruti, 2008). Only recently has the official recognition of Quilombola School Education occurred (Brazil, 2012), which represented an important step for remaining quilombola populations to be promoted for a schooling, that value Afro-Brazilian and African history and culture, as well as respect for ethnic-racial relations in the school curriculum.

In the next sections we present some elements that explain the proposal of quilombola education, and discuss the challenge of research in mathematics education that discusses the ethnic-racial relations in this context. We also present aspects of a study developed with teachers of the early years of a quilombola school, whose results illustrate the need to address the issue of prejudice and disregard for African mathematical knowledge.

2. Relationships between Mathematics Education and Quilombola Education

The school contents of Mathematics can also be approached in such a way as to problematize socio-cultural issues (D'Ambrosio, 2002), such as questioning racial prejudice and giving visibility to African culture. In this sense, Cunha Junior (2004) develops the term Afroethnomathematics, which refers to studies of mathematics created in the African continent and the contributions and interrelations with its popular myths, religions, architecture, astronomy, arts, dances and games. Afroethnomathematics begins in Brazil based on research that revealed the precariousness of the teaching of mathematics in these quilombola areas. In addition, the low student performance was explained only as personal problem, desconsidering problematic aspects from the educational system. Cunha Junior argues that this situation was justified by the racist consensus that black would not have skills to mathematics, an ideological explanation for the lack of public policies of the state.

In Brazil, since the 1970s, various organized groups have constituted what is called the negro movement, which has fought against the discrimination and exclusion of the Afrodescendant population in the country. The federal government has adopted anti-racist and antidiscriminatory policies to enforce international treaties and meet demands from social movements. In 2003, the teaching of Afro-Brazilian History and Culture in Basic Education became mandatory, and more recently, the Quilombola School Education (Brazil, 2012) was officially established.

Lopes (2010) argues that although there are specific guidelines for Quilombola Education, there is still a long way to go, because the discussion seems to be limited to a differentiated attention to the quilombola school through financial resources to improve infrastructure. In general, there is no differentiated curriculum proposal that values African knowledge and combats discrimination.

Another important issue is the fact that this theme seems to be almost completely disregarded in Brazilian research in Mathematics Education. Diniz (2017) conducted a systematic review of the literature to identify articles that addressed the learning of Mathematics by Afro-descendant students in the context of Quilombola Education. The research was carried out among the articles published in the period between 2012 and 2017 in 95 Brazilian journals with the best concepts in the Teaching area of Capes (Coordination of Improvement of Higher Level Personnel) in the Qualis system (strata A1, A2, B1 and B2). After analyzing the titles of the published articles, only two articles that were related to the research objectives were selected. An article presented a study to identify mathematical knowledge in the production of manioc flour in Lagoa da Pedra, state of Tocantins (Vizolli, Santos & Machado, 2012). And the other selected article addresses aspects of Geometry in the architecture of a quilombola community (Castro & Vizolli, 2013). Diniz (2017) argues that the two published studies, despite being related to the theme, do not delve into more complex aspects of Mathematics Education in Quilombola Education, such as prejudice and the devaluation of African mathematical knowledge.

Cunha Junior (2017) argues that there are several possibilities of establishing relations between African cultural knowledge and Mathematics Education. For instance, games of African origin, such as *mancala* games, have been pointed out as an important resource for the teaching of mathematics associated with the historical-cultural rescue of African knowledge (Pereira, 2011, Zuin & Sant'ana, 2015). Santos (2008) argues that the introduction of this game "enables a broadening of the horizons of non-black students, once the contact with African mathematical knowledge, can modify the stigmatized, stereotyped and sometimes prejudiced view on the African continent and of their descendants "(p.5).

The term *Mancala* originates from the Arabic word naqaala which means to *move* or *transfer* (Macedo, 2015). *Mancala* games have probably sprung up in Egypt from the Nile Valley, spreading across the continent and other parts of the world. The supposed place of origin contributes to the belief that it is the oldest game in the world, with records dating back to 7,000 years.

Mancala oware is considered a strategy game, that is, without any luck interference (Padrón & Déniz, 2011). It is played with a board game similar to that shown in Figure 1. The initial procedure of distributing seeds into all pits, without distinction, resembles a sowing process.

Figure 1 - board to play oware

Source: http://www.africaheartwoodproject.org

In this article we discuss aspects of a qualitative study of exploratory nature, whose general objective was to investigate the possibilities of one of the most well known mancala games, *oware*, to articulate to sociocultural aspects to teach mathematics in the early years of a quilombola school (Almeida, 2017). The study also had specific objectives to explore proposals of activities that articulate sociocultural aspects of the game with Mathematics from the reflections built with the participating teachers; and to analyze the possible contributions of the game to rescue African mathematical knowledge and to problematize situations of racism.

3. Method

3.1. Participants

The study was a qualitative one, having as participants three teachers who taught in the initial years of a quilombola municipal school, located in the community of Onze Negras, municipality of Cabo de Santo Agostinho (2015) in the state of Pernambuco. In this report of the research, the participants received the fictitious names: Ashanti, Niara and Shaira. These names are originally from Ghana, and mean respectively power, great purposes and poems. Table 1 (below) presents the main profile data of the teachers.

Table 1 - Professional profile of research participants

	Ashanti	Niara	Shaira
Age	44 years old	60 years old	46 years old
Education Degree	Pedagogy	Mathematics	Pedagogy
Time as teacher	21 years	38 years	27 years
Time at quilombola school	04 years	20 years	09 years
Class group	Regular: 1º ano	Bi-serial: 4º/5º	Bi-serial: 2º/3º

As we can observe in Table 1, the participants had ample experience as teachers. Niara was the most experient teacher. Ashanti was teaching in a regular class of the first year and the others had bi-serial group, which were formed by students from two years. None of the teachers reside in the community, or are related to the residents. Two of the teachers are Afro-descendants.

3.2. Procedures

In visits to the school to carry out the research it was identified that the participants formed a group that was working collaboratively and that they were committed in promoting a work that consider quilombola cultural aspects. After these initial contacts, an interview was held with each of the teachers, at which time the ethical principles of the research were explained, the purposes of video and audio recordings, and anonymity guarantee. Each participant agreed to the proposed procedures and signed the consent form.

The interview script was composed of questions about professional profile; data on continuing education and pedagogical guidance; about teaching mathematics and working with games. The data generated by the interviews were analyzed in a reading process, being selected more significant stretches of the protocols.

The analysis of the interviews also provided a basis to organize five monthly meetings, in which the fourth author of this article worked collaboratively with the group of participants, mainly to present the oware game and its potentialities in the teaching of Mathematics in a quilombola school. Table 2 presents the contents of each meeting.

Table 2 - Contents of collaborative meetings with teachers

Meetings	Contents
1 may/2016	Presentation and playing *oware* game
2 jun/2016	Elements of African Mathematics; Steps for working with games
3 jul/2016	Analysis of oware and planning activities for classroom
4 oct/2016	Aspects of afrodescendant identity and its relation to the oware game
5 dec/2016	Evaluation of activities

During the period between these monthly meetings the teachers developed activities in their classes. Impressions on these encounters using the African games were shared at the subsequent meeting. During the meetings, participant observation procedures were carried out (André, 2016) and recording in audio, photography and video. The recordings were transcribed integrally generating protocols.

3.3. School and community context

The municipal school where the study was carried out is located in the Onze Negras quilombola community (Cabo de Santo Agostinho, 2015), whose history runs through the struggle for government attention and recognition of its title as a quilombola. In 1980, Afro-descendant women from the community joined forces to create the Mothers' Group, striving for equal conditions of employment and income opportunities, which resulted in some infrastructure gains for the community. This leadership by women gave rise to the name of the community and the community group: Onze Negras (Eleven black women). Currently, approximately 486 families live in that quilombola territory (Santos, 2012).

The local school is not alien to quilombola community struggles, having its social role expressed in projects of the pedagogical team that seeks to bring African culture to the students and community. The school building is made up of three small classrooms with little ventilation but well lit. At school four teachers work; a principal, a pedagogical supervisor, two cleaners and a responsible to the school lunch. The school attends Early Childhood Education and the initial years (1st to 5th year).

4. Results and discussion

Analyzes of interview data indicated that the three participants did not know about games of African origin or about Afroethnomathematics. Even so, the teachers' responses suggested an awareness of the potential of mathematics teaching for a multicultural perspective. This lack of knowledge about Mathematics contents originating in Africa, precisely among teachers working in a quilombola school was one of the aspects considered to guide the monthly meetings.

In this article we will reflect from excerpts from Niara's words verbalized in these monthly meetings. The choice of focusing on Niara's speech is related to the fact that she was resistant to utilize oware game, despite having participated in the discussions in

the meetings with the group of teachers. Niara has a degree in Mathematics; she was the eldest; she has greater experience of teaching; and more time as a teacher in that quilombola school. It was hoped that the teacher would know more elements of the history of the school, the community, and to have a greater contribution to the Quilombola Education.

In the first meeting, the collaborative group comprised of the participant teachers and the fourth author of this article discussed historical and philosophical aspects of oware game, its caractheristics and relationship with the land for Africans. The rules of the game oware were presented through a video, which during the exhibition there were pauses for explanations and clarification of doubts. In the course of the discussions the dialogue between Niara and Shaira provoked several reflections, according to the following passage of the protocol:

> *Niara*: I have some students who, if they know that this game (oware) is African, wont to play [...]
>
> *Shaira*: ...But the school has a very important role in combating this type of thinking, we need to bring this type of activity.
>
> *Niara*: [She nodded positively].

Niara's speech expresses apprehension in approaching this resource in the teaching of Mathematics, since it predicted that some students could present a prejudiced attitude only by the fact of being an African game. Even after the speech by colleague Shaira, it may be noted that Niara's "response" was a gesture, a nod. She did not yet seem willing to continue her argument. This participation of Niara explains the need to raise teachers 'awareness to face their own resistance and the students' ability to use a game of African origin to teach mathematics, an unknown resource of the traditional curriculum. Thus, it seemed that it would be very important to establish several strategies in order to approximate the teachers to oware game, so that they could understand the possible links between the teaching of Mathematics and the knowledge about Africa.

In the second meeting, Niara still proved resistant and skeptical to work with the game. However, during the other meetings his engagement in the process brought frequent reflections to the group through his speeches and suggestions. An example was during the 3rd meeting, when aspects of the work of Gomes (2000) and Menezes (2009) on the dynamics of cultural elements, which can be constructed and reconstructed, were discussed. The researcher who participated in the meeting argued that the students' contact with playful elements of African and Afro-Brazilian culture, in addition to bringing this knowledge closer to the quilombola community could also promote a reconstruction of the same in the re-signification given by pupils. In this discussion, Niara brought at least two important contributions, as it exemplified by the following excerpt:

> *Niara: ... we do not have a proper quilombola institutional education ... Why do you also have to see that those games, those things all... which have as basis, many other games ... until today. [...] we are in a connected age. We're not in a time when you're just going to want the boys to jump rope [...] make a mandala, and there goes, all these things, play and play those games in school, because things are more accelerated, technology is knocking on people's door and we cannot leave the student uninformed because he is a quilombola, he has to be equal, he has to have his accessibility of knowledge formation, he has to be leveled, not only because he is a quilombola that has to keep that root pulling, it will come a moment in life that he has to compete head-on, does not he?*

Ashanti: Exactly, otherwise it becomes discrimination, isn´t it?

Niara: [...] I'm a quilombola, it seems that I am like someone accommodated, or marginalized.

Niara's skeptical discourse revealed doubts about the utilization of cultural elements, such as games, to teach mathematics and other school subjects. It raises arguments that question the potentialities of a game such as oware because, unlike rescuing African culture, it could restrict the possibilities of quilombola students. Thus, she questioned about why she utilised games in an era with access to various information and communication technologies (*connected*, according to the term used by the participant).

In the dialogue with Niara, Professor Ashanti verbalizes the word discrimination, referring to Niara's concern that Afro-descendant students from a quilombola school did not only have access to resources such as games. In this sense, access only to these types of resources could even constitute discrimination, reinforcing social labels, which according to Professor Niara were already attributed to residents of quilombola communities: "acomodados" or "marginalized". If, on the one hand, the teacher's concern to defend the expansion of the possibilities of access to resources is important, on the other hand, the repulsion for games of African origin could also represent the teacher's prejudice that could attribute a lower status only by not if it is a more current technology. Studies that have explored the *oware* game indicate that there are several possibilities to play, in which complex mathematical notions can be developed (Rêgo & Rêgo, 2000, Macedo, Petty & Passos, 2007). In this sense, it would not be just the fact of access to computers or educational software that would necessarily imply better and more complex learning (e.g. Carvalho & Monteiro, 2012).

Still in the third meeting Niara argued about the rescue of African culture as being very difficult to be accepted by the students and their families. In order to illustrate it, she narrated an event that seemed elucidative, according to the excerpt that follows:

Niara: The cultural not ... They have even fear ... [did not finish the speech]. Their own culture here is the cane plant [sugarcane], 90% are evangelicals ... the [African] cultural here does not exist ... The most that we have achieved here... I... it was an experience of mine, I do not know [the experiences] of the girls [refeering to the other participant teachers] ...it was the historical social rescue, the role of the black in society and his history in Brazil. I got to see this, but the cultural here does not exist. Look, we went to make a band, weren´t we? [In the Independence Day of Brazil parade] The children were going to dress similar to the Olodum[1], it was beautiful, the band beautiful, beautiful, beautiful, with those bands [...] each one more beautiful than the other. My dear, when our band went to parade on the Cape [referring to the town center] the public audience took boo, was not it? The beautiful, beautiful band, you know that? The public shout boo. It took an artist who was in the day, a black singer, to go up on stage and say the value of that band that was there. I cried, I cried in the middle of the street. It does not have that Afro culture itself. Their own culture is non-acceptance, 90% of families are evangelical. My dear, when our band went to parade on the Cape [referring to the town center] the public shouted boo, wasn´t it? The band was beautiful, beautiful... did you know that? [Asking to the other teachers]. It was necessary that an artist who was in the day, a black singer, to go up on stage and say the value of that band that was there. I cried, I cried in the middle of the street. Here, there is no that proper Afro culture. Their own culture is of the non-acceptance one, 90% of families are evangelical.

[1] Afro-Brazilian musical group of the state of Bahia, well known nationally for its music and dance.

The incident with the school students in a civic parade of independence, in which they were ridiculed because they represented a black musical group, seems to have been a very distressing experience for Niara. Perhaps this explains in part the teacher's resistance and the fear of not accepting work with the African game by the students.

The situation narrated by Professor Niara in this third meeting may be directly related to what she said in the first meeting: I have students if know that this game is African, they will not want to play. In her speech the teacher refers to the fact that there are a large number of evangelical churches in the municipality, many of which openly defend the idea of Afro-Brazilian cults, and consequently other African values, would be evil works and that they should be combated.

Still in the continuity of the discussions of the third meeting, the question of the silencing of African-based mathematical knowledge in didactic materials received by the school like books, magazines and games sent by the MEC was raised. In the comments of the group it was emphasized how much the works developed by the program Afroethnomathematics are necessary in the Quilombola Education. Niara contributed discussing commenting about the challenges and impossibilities.

> *Niara: I keep thinking about this concern that she [referring to the researcher] said. Come on, Shaira, let's think about curricular policy. Let's go to the PCNs [National Curriculum Parameters] ... there is not. And worse, it will get worse, we are on the verge of not having Arts in High School, we will not have Philosophy, it will become a disposable matter ... because a lot of people think that Philosophy is that guy who sits down thinking [...]. Imagine putting on the curriculum that we have to rescue these African origins, put it in a college ... [cites the name of a private school for the upper middle class] look ... see that impasse ... It's a shock ... culture that was not accepted from the beginning, for you to change ...*

Professor Niara's speech is that in practice this obligation remains far from the curricular organization of private schools. Santos (2011) discusses evidence that African history in Mathematics classes is also far from the practices of public schools. Santos points out that in association with the lack of specific materials that enhance African culture in Mathematics and the need for continuous training, the teachers participating in their research also did not seek to insert these contents in their classes, arguing that they did not know these guidelines or did not have time.

The teachers reported other African and Afro-Brazilian games they were using with the students, such as Shisima and the game of pebbles, arguing that concrete was the best to work with students, and even indiscipline improved with these games, participants said. Regarding the role of games as a sociocultural element, the teachers emphasize:

> *Ashanti: The culture is changing and because of the changes in this culture, the students do not know about these games.*
>
> *Niara: Some time ago, the children here were playing beautifully on circular dances; high tide, low tide with the rope, beautiful cantigas of circular dances, now, even this I am not seeing more, it is over...*
>
> *Researcher: That's why the school's role in rescuing these games is so important ...*
>
> *Niara: The play of the stones we can work space and time.*
>
> *Shaira: The hash and the hopscotch game are very complex, but we realize that to get to what it is today, it started with them.*

When teachers say that they perceive the evolution of complex African games, for simpler games nowadays, we perceive the reconstruction of these from the mediation of different peoples, at different times, which influenced the characteristics of those and the same time they were influenced by their relations. Therefore, it is important that these resources are accessible to future generations in the school space, which will give new meaning to them, adapting them, exploring their characteristics, selecting those with whom they identify and mainly learning from them.

Especially in an age when digital games seem to conquer more spaces for children, also playing an educational role in a technological society, traditional games still play a specific role in transmitting values and knowledge that influence the formation of positive identities. In addition, the creativity and mastery of the teacher about the mathematical knowledge that he wants to explore, allows him to use this element in order to provide several possibilities of learning. The important thing in this work is to keep in mind that this is a playful element (Kishimoto, 2010), and that it should allow for pleasant experiences for the student.

5. Conclusions

As Cunha Junior (2017) argues, the historical experiences of the knowledge of African mathematics are still far from everyday school life. Although this fact was not expected, it confirmed the importance of the insertion of this type of articulation in the teacher training of the initial years.

We consider that there is an emergence of African-based mathematical knowledge in everyday school life, which was discussed in the field research presented in this article, especially mathematical games, for the construction of reafricanized memories. These are necessary not only for the quilombola people, but should be extended to the entire Brazilian population as cultural patrimony of our History. We emphasize the need for more research in the area of public educational policies for quilombola peoples, focusing on mathematics and contributing to overcoming social exclusion.

In our results we identified that particularly the oware game is a rich element to make the interlocution between the cultural questions and the process of teaching mathematics. However, we point out the need for future studies with other teachers in the early years of Quilombola education in order to collect other data on the activities that can be explored from the game and how they can bring closer to the students: African-based mathematical and sociocultural knowledge.

The literature review on the relationship between Mathematical Education and Quilombola Education indicates that very little has been investigated on this subject. Ethnic-racial equity in basic education also depends on knowledge that is researched and problematized in studies, because one can try to understand reality and act in a transformative way about it. It seems that the culture and knowledge of African mathematics remains unknown, invisible or devalued.

Future research that addresses the teaching and learning processes in quilombola schools could contribute to confronting the prejudices of the agents involved, teachers, principals, families and the students themselves. In this, the statements of Professor Niara, analyzed in this article were illustrative of some of the great challenges of a Mathematical Education with equity for Afrodescendants. Among these challenges we highlight the access to new technologies and the awareness of educators to the rescue

and valorization of African mathematical knowledge. In addition, it seems necessary to create mechanisms that strengthen these educators for a confrontation of prejudice and its consequences.

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