



RESEARCH ARTICLE

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THE MATH TEACHER'S LOOK ON THE USE OF MANCALA AS A PEDAGOGICAL TOOL

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ABSTRACT

The teaching of mathematics presents, historically, difficulties that are expressed, in a general way, in unsatisfactory learning results at all levels of education. To have a satisfactory, attractive, pleasant and contextualized learning with a focus on the student, the teacher must reflect on new teaching methodologies, such as the use of pedagogical games. Educational games have been used frequently in classrooms for some time, as a resource that can bring excellent results. As an example of games, we can cite the game mancala. This game can develop in the student important characteristics for learning mathematics, such as logical reasoning. In this perspective, the objective of the research is to understand the conceptions of mathematics teachers about the use of mancala, through a qualitative approach, using as a data collection strategy a printed questionnaire with the teachers of a primary school located in the city of Acarape, Ceará, aiming that these professionals reflect and list what they know about mancala, its use in the classroom and its perspectives of change if they apply it in the future. The results obtained revealed that the professionals knew about mancala even before they had training about it and that the bias of this knowledge was referred to UNILAB, believe that a mancala is a tool capable of explaining various topics of mathematics and even social, as for future applications most teachers would change something by applying it again.

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INTRODUCTION

Mathematics is one of the most important subjects in the school curriculum; however, it is one of the most feared by many students during basic education. It is named as very complex, with definitive reasoning, filled with formulas that must be decorated (CODINHOTO, 2017). With this premise, studies and different pedagogical and formative actions have been developed in order to promote a differentiated Mathematics teaching, capable of making the learning of this curricular component more meaningful. However, it is during elementary school that this view of mathematics teaching should be more focused, for it is in this period that the most basic notions about the subject are developed.

As a strategy to catch the students' attention, nothing better than to promote moments in which students can learn and have fun, this is possible through games, which " [...] make the classes more pleasant and attractive, since they stimulate reasoning, cooperation and discovery in problem solving" (CODINHOTO, 2017, p.57). In this way, work proposed to understand the conceptions of teachers about the use of a game, the mancala, in a primary school in the municipality of Acarape, Ceará. A priori, it was sought to develop a research that would link African culture and Mathematics, it was thought to write about games because it is a methodology very present in the teaching of Mathematics and it was then that it was discovered the existence of a school close to one of the Campus of the University of the International Integration of

Afro-Brazilian Lusophony (UNILAB) where the teachers had a training to work in Mathematics with an African game known as mancala. The idea of the research had as main objective to understand the conceptions of the professionals about the mancala, since they have gone through a formation to work with the game. The specific objectives were: i) to identify the profile of the mathematics teachers studied; ii) to analyze the use of pedagogical games and the mancala by the researched teachers and iii) to verify if these teachers reflect their practices when applying the mancala in the classroom. The importance of research is justified, among other factors, by the fact that the mancala game is different from those usually worked on or developed in the classroom. Thus, we can affirm that unveiling the opinions of professionals who teach Mathematics in Elementary School, about the game as a pedagogical tool, becomes of great value, since it is during this phase of teaching that the basis and the taste for this discipline is developed that accompanies all subjects to the logo of basic education.

The mancala game: It is a fact that the mancala game has been used inside the classrooms as a tool capable of collaborating with the students' learning. What is mancala, anyway? Where did you come from? According to Zuin and Sant'Ana (2015) there is no consensus on its origin, there are those who point out that the mancala was born around 200 BC, and others who consider that the game came to exist in Africa about 7000 years ago, being the first of all board games. The authors also add that the term mancala is derived from the Arabic *naqahala*, which means to move or transport and that the game is known as a sowing game, since the stones are like seeds to plant.

Like every game, mancala consists of rules, Macedo et al. (2007); describe the basic rules of this game as follows:

- a) they are played by two people, one in front of the other, with the board longitudinally placed between them;
- b) before starting the game, the same number of seeds are distributed in each of the cavities of the board;
- c) the players alternate to play, distributing the seeds of the chosen cavity, one by one, in a counterclockwise direction, in the subsequent cavities;
- d) there is always seed capture, the form of capture is different, depending on the game in question;
- e) the game ends when there are too few seeds left for the game to continue or when there is only one seed left on each side;
- f) the winner is who has the largest number of seeds;
- g) the strategies of the game involve calculated moves, which require much concentration, anticipation and intellectual effort (MACEDO, 2007, p. 71).

As we can see through its rules, mancala is a game that involves abstraction and can be applied as a pedagogical tool in different classroom contexts and in the achievement of various goals that the teacher wants to achieve. Corroborating this, Gassi (2008) states that to choose a game it is necessary for the teacher to consider the needs, potentialities, interests and desires of his students. Considering such aspects are crucial, so that a pedagogical tool like the mancala takes effect and does not become a mere repeated methodology with no positive effects, but that allows an improvement even of the game, being able to add or modify some of its rules. Of course, as D'Ambrosio (2013) says, there are no roadmaps to improve methods; it will all depend on the students, the teachers and the

interest of all involved. Unlike games of chance, mancala requires strategies, students to succeed in this game need concentration, math knowledge and logical reasoning. For Santos (2008), the mancala demands from his players calculated moves, vision of next moves, concentration and effort. This author also believes that one can only learn to play, by playing and using reasoning and patience. Therefore, students playing mancala elaborate strategies develop logical reasoning and mathematical skills and begin to predict their future movements as well as those of their opponents. Indeed, the Mancala game has a constant research implication, so that all the seeds that conduct the sowings will be important from the harvest perspective. The students, in this interval, need a lot of attention in each sowing and concentration to make the right decisions about throwing their seeds and always with a lot of attention in the sowing of their opponent. Finally, it is important to add that by using the mancala in Mathematics classes the teacher will be exercising Law 10.639/03, which amended the Law of Guidelines and Bases of National Education (Law 9394/96) and made compulsory the teaching of Afro-Brazilian and African History and Culture in school curricula.

Mathematics education

The teaching of mathematics changes over the years due to the needs of society and this causes new methodologies to be studied and implemented. In the current context, there is a lot of talk about teaching mathematics in a context of different knowledge so that students can learn, leaving aside the fear of believing that the discipline is very difficult, a bogeyman, and that only *nerds* learn. According to Reis and Nehring (2017, p. 341) "contextualization as a movement triggered in a teaching proposal aims to ground the learning process, since it makes it possible to establish the student's meanings for mathematical concepts". However, it is important to note that teachers are often asked to provide this contextualisation of teaching, but are not offered different supports for doing so. The teacher has a very important role in the teaching and learning process of his students, but often the working conditions, the available resources, among other factors are insufficient for an innovative pedagogical practice, sometimes making the teaching of mathematics stigmatized, full of formulas, theorems and postulates that students do not see sense. Student failure and success depend on a completely educational and social context, but it is common for teachers to be blamed for failure at school and in mathematics, this is recurrent. What does not help at all, because what needs to be done among so many other things, is to train our teachers, who are continually challenged to update themselves so that they can try to teach in a different way than they have experienced (FIORENTINI, 2008). This is because old methods do not contemplate the new times (CORTELLA, 2014).

The challenge of the math teacher today is to make the classes interesting and meaningful for the students and for this, he should always reflect his practice, so that he can make the classroom environment a pleasant place, where the student can question, raise hypotheses and improve his pre-existing knowledge. After all, "the practice of thinking the practice is the best way to think right" (FREIRE, 1987, p. 65). In an attempt to make classes more attractive, many teachers use educational games. The game applied in the classroom, besides being different, favors the students a new way of learning, where they are active agents in their learning. It is important to

note that the National Curriculum Parameters (NCPs) (1998, p.47) state, "Games are an interesting way of proposing problems because they allow them to be presented in an attractive way and encourage creativity in developing strategies and resolutions and finding solutions". This way, according to the NCP's games allow students to develop creativity, strategies and search for problem solutions. The games have been gaining more and more space with the intention of making the classes more enjoyable; to make the student think clearly, develop their creativity and logical reasoning. According to the NCPs: "besides being a socio-cultural object in which mathematics is present, play is a natural activity in the development of basic psychological processes [...]" (BRAZIL, 1998, p. 68). Thus, games stimulate in the students interest and pleasures that are essential for their development, so it is up to the teacher to evaluate different methodologies to work with the students in the classroom where, above all, the child can arouse an interest in mathematics discipline.

Knowing the methodological procedures and the subjects of the research: Due to the complexity of the object of study, we opted for the qualitative research approach, so that the strategy of approaching the reality occurred through questionnaires, which made it possible to collect data from teachers who teach Mathematics in a primary school in the municipality of Acarape, Ceará. The criteria used to choose the teachers was the fact that they were the only Mathematics teachers in the municipality in question, who took part in a training offered by the municipality on how to teach Mathematics and how to apply two games, including Mancala. The analyses of the data were done in a descriptive way, contextualizing with our research.

The questionnaire addressed to teachers was divided into two parts: i) questions on the teacher profile; ii) questions on the use of mancala and educational games in general.

With regard to the first part of the questionnaire, it has proved very important to understand the profile of those surveyed. The teachers who received the training total 7(seven), but only 5(five) were able to collaborate with the research.

Among those interviewed we have a considerable variation in teaching time, being two teachers with one year of exercise, one with six years, one with ten years and one with 18 years of teaching. The gender division pointed out a similar data, with two of the five education professionals being male and three female. Evidence of a work environment divided between the female and male public. Regarding the workload, we have found that three subjects are crowded with 100 h/y, while the others have 200 h/y. Regarding the time dedicated to the systemic planning of classes and activities, we obtained that three teachers (60%) dedicate up to eight hours a week for this and two (40%) save between eight and sixteen hours a week for these activities. It is important to emphasize that according to Law No. 11738 of July 16, 2008, which deals with the national professional salary floor for professionals in the public administration of basic education, in its article Article 2, paragraph 4 states that "in the composition of the working day, the maximum limit of 2/3 (two thirds) of the workload will be observed for the performance of interaction activities with students" (BRAZIL, 2008). Thus, the two professionals who work in a 200h/year regime must have around thirteen to fourteen hours dedicated to their weekly planning, which

corresponds with the data, collected. In order to identify teachers, but also to maintain their anonymity, we have carried out the following scheme for questions in the second part of the questionnaire, the term "ProfMM" to represent the mathematics teacher who uses mancala in his classes, plus a number representing the order of the teacher in that school. Thus, we have named subjects of type ProfMM 1, ProfMM 2, among others. The second stage of the research sought to list teachers' conceptions of mancala and pedagogical games in a broader way, through five questions, four of them subjective.

The mancala game in math class: Contextualizing Mathematics is undoubtedly one of the great challenges of the Mathematics teacher today. According to D'Ambrósio (2012) the contextualization of mathematics is crucial for all subjects, so the first question was directed to ask them about the general context of the mancala, that is, how they knew the mancala and whether they could point out its origin, since knowing this information allows them to have a greater basis in the classroom, making the mancala full of meaning and not just a simple methodological instrument used mechanically. The answers to this question bring Unilab as a reference, as we can see in 4 of the five answers: "I met through the University (Unilab), as a methodological instrument, its origin is African, but had some adaptations in other countries" (ProfMM 1); "Through a teacher of Unilab and the pedagogical formation of the municipality of Acarape, whose origin was in Africa" (ProfMM 2); "Through the students of the PIBID project that I followed from 2014 to 2016, at the institution Unilab" (ProfMM 3); "I got to know the game through a Cape Verdean friend at Unilab and in the opportunity we decided to do a workshop within the Institutional Program for Teaching Initiation Scholarships (PIBID). The origin of the board is in Africa, an ancient board game" (ProfMM 4). In order to complement the first question, we made it possible for the teachers to say if they have already used it and why they decided to use the mancala in the classroom, the information that stood out brings the fact that according to them the use of the tool: "[...] is excellent for working and stimulating the interaction of the contents ludically" (ProfMM 1); "it was because it presented something new, exploring the culture. Then, for what the game represents in relation to respect with the opponent" (ProfMM 2); it brings "[...] affinity and [...] possibilities with mathematics" (ProfMM 4). ProfMM 3 and ProfMM 05 have not yet used the mancala. Knowing that games are methodological resources that have been gaining space within the classrooms (LARA, 2011), in our questions, we asked teachers to mark the frequency in which they use pedagogical games in their classes. As a result, we found that three teachers (60%) use pedagogical games in their classes every two weeks, one teacher (20%) uses games every month, and one teacher uses more not once a week, neither every two weeks nor monthly. Based on the use of games, let's see in Fig. 1 below, some of the bearings used by teachers.

The application of mancala in the classroom allows teachers to approach mathematical themes in a different way, for this reason we investigated its use, that is, its practice as a bias to improve student learning, we obtained the following answers: "The playfulness is always an input that contributes to significant learning, found in the rules of mancala many mathematical concepts such as logic, sequence, concentration, reasoning, among other skills" (ProfMM 04); "In the classroom, mancala allows a more interactive approach. The stimulus and rational sense provided by the game is fundamental for a



Source: Authors' collection (2020).

Figure 1. Experiences of mancala with elementary school students (A; B and C)

differentiated and culturally richer learning" (ProfMM 01); "I consider it positive, because the game encourages, in addition to respect, attention, reasoning, concentration and the prospect of harvesting what is planted" (ProfMM 02); It encourages and stimulates the students, as regards learning about mathematical operations" (ProfMM 03); "[...] provides various contents, just the educator to make a plan that complements the game" (ProfMM 05). Among some aspects in common in the speeches of the researched subjects we have that the mancala improves the reasoning and brings individual improvement, characteristics that as Lara (2011) says are important for Mathematics in general, because it is now seen as a means of acquiring rationality, individual and social improvement. It is important for the teacher to observe his students, so that he can also evaluate himself and his practices so that he can learn from them. After all, "only those who are good learners are good teachers" (CORTELLA, 2014 p. 39). From this perspective, we asked the teachers what their vision of the game would be. Two teachers have not used the game yet. The others, who used, brought important contributions to the research, the reaction of the students according to this was "Of surprise and interest by the fact that they did not know and that they differ from some Brazilian games" (ProfMM 02); "about how the reasoning is important before any action during the game" (ProfMM 01). Collaborating as the questioning we have to: "the game that with its "mysticism" and spirituality manages to have an acceptance and many after knowing it reapply at home, in groups of friends and other spaces" (ProfMM 04). The testimonies brought forward were very pertinent, since the teacher must always be questioning himself, his answers make it clear that they do this, which is an important fact for them to be able to make changes in teaching, because "it is in the reflected action and in the resizing of their practice that the teacher can be an agent of change" (LIMA, 2002, p.7).

The changes may be minimal, but if they exist, they make all the difference, so let us ask what teachers would improve in future mancala practices and obtain: "Expand/fortify the concepts of Africanity, African worldview, and the social values that the game has in Africa" (ProfMM 04); "the game is excellent, it allows numerous applications. But the mathematical approach is much centralised, a new modelling should be worked on which could broaden the contents covered" (ProfMM 01); "First, I will take the mancala to class, and then I will demonstrate its origin, as well as its way of playing it. After that, demonstrate to the students the possibilities to relate the content seen in room with the game"

(ProfMM 05). One teacher said he would not change anything about the game (ProfMM 02) and the teacher didn't answer the question (ProfMM 03), which is understandable because we have two teachers who haven't had the opportunity to use the game in class yet.

Conclusion

The research developed with teachers from a basic education school in the municipal network of Acarape, Ceará, proved an important subsidy for understanding the perceptions of these professionals, and about the use of pedagogical games in particular mancala. In the results obtained, from the printed questionnaire, it was made explicit that most teachers use pedagogical games quite often and as far as mancala is concerned, they believe that it can bring positive results, so desired when we refer to the teaching and learning of Mathematics, because mancala would be able to develop important skills of this discipline, such as rationality. We can see that the teaching of mathematics, as stigmatized as it may seem, is increasingly differentiated, among the factors that contribute to this we can cite the policy of training mathematics teachers that is increasingly distinct, which has been trying to bring mathematics closer to the students. This fact can be exemplified through pedagogical games such as the mancala, which brings with it a whole playfulness, is able to enhance the learning of Mathematics, and contributes to the development of important aspects for social life and for our culture, which also brings in its essence the Africanity. Finally, the existing deficiencies of students with mathematics can be partially remedied if the teacher knows how to work well with a tool, which can be the mancala, as is the case with the teachers studied. We can see that teachers ponder, reflect and are able to modify their future practices with regard to mancala, which makes them subjects capable of working very well with such a tool.

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