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THE USE OF THE TOWER OF HANOI IN VOCATIONAL EDUCATION OF YOUTHS AND ADULTS

Idaraí Santos de Santana

<http://lattes.cnpq.br/7193553372636554>

Helena Tavares de Souza

<http://lattes.cnpq.br/4655903759300884>

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INTRODUCTION

Cultures and norms tend to promulgate variations in the relationships between work and teaching. This comes from delimited contingencies, interposed by each historical time of the social environment, consequently implying its historicity, as well as the entire core that involves the social process, and not just isolated actions. The concepts related to ideology result in the basic sense, however, others, such as education, for example, emanate from theoretical speculations that, it is noted, are an integral part of the human and cultural condition, experienced through the human sciences.

The consensus of professional education (PE), taking into consideration, the education of young people and adults (EJA) under the centrality of the theoretical teachings of the Tower of Hanoi, in the learning of mathematics, slides through the understanding of the universe of society that represents itself socially, the which work can be cited, which is of great value for determining the basic conceptual figures surrounding the entire social process of young people and adults.

In the Brazilian context, work is seen as a factor present in students' daily lives in a discursive, practical and, above all, institutional way, based not only on PE, or training within EJA, but also on Secondary Technical Professional Education (EPTNM) which highlights "compellingly" that it is capable of maximizing domestic economic and social progress, since it would "consequently" produce greater productivity for economic sectors and a less uncertain and more compensatory margin of financial return for those who are willing to undertake such training (Gawryszewski, 2021). Understanding, therefore, the intrinsic need for productive "delivery" of teaching modalities aimed at young people and adults, making them attractive pieces for an

exponentially productive and inquisitive market, which requires specialized and inexpensive labor.

Learning the elementary characters of mathematical teaching is a crucial factor in everyday professional life, not necessarily complex and specific topics that make up a degree in the discipline, but with the aim of providing a working framework for future or already active professionals.

In considerable situations, only didactic activities occur that artificially articulate Mathematics with other areas of knowledge; however, such treatments reveal initial and timid handling of the discipline in question, in which they maintain, at their core, fractional practices that have little influence on the student accepting the meaning of mathematical knowledge in reality (Gonçalves and Pires, 2014). But the teacher mobilization, with pedagogical foundations and didactic purposes, of the work practices of EJA students, in the dynamics of school absorption, primarily in the intricacies of learning Mathematics, also reverberates reflections on the cognitive processes pertinent to the learning of young people and adults little schooling to come into contact with abstractions or games symbolically organized based on exclusively syntactic rules (Schneider and Fonseca, 2014).

Such formulations from a teaching perspective must consider the particularities of the education of young people and adults, facilitating the prolonged and sustained absorption of mathematical concepts that can and must be understood through pedagogical tools diverse from traditionalities, such as the Tower of Hanoi game, for example.

This way, this study presents a qualitative-quantitative study whose central objective is to analyze the contribution of the Tower of Hanoi game as a means of achieving sustained and long-lasting learning of mathematics

through the use of open and closed questions for students and teachers. linked to public education in the city of Salvador (BA), justifying the need to think about the subject in question as a tool that catalyzes the knowledge of professionals contextualized in Youth and Adult Education.

METHODOLOGY

The study in question was conducted in Salvador - BA between February 2022 and September 2023, covering students from two public schools located in the neighborhoods of Engenho Velho de Brotas and Cabula, notoriously identified by their low score on the Human Development Index (HDI). The research aimed to analyze the contribution of the Tower of Hanoi game as a means of achieving expressive mathematics learning. In this context, this study adopts a qualitative-quantitative approach that combines both perspectives in the same research. This allows subjectivity to be minimized while bringing the researcher closer to the object studied, providing greater security to the data and promoting flexibility in the approach.

As for its nature, the present work falls within the field of applied research, in line with the approach taken with the aim of resolving issues identified within the societies in which the researchers are located (Gil, 2020). This undertaking can, therefore, result in the elucidation of scientific principles that contribute to the progress of understanding in a particular sphere of knowledge.

Given this understanding, the option to conduct applied research is not restricted to the adoption of a new theoretical approach, but also aims to implement a practical intervention that materializes the consequences of the study. This focus manifests itself in the investigation of the historical foundations of a specific social practice, namely, the learning of mathematics within the scope of Youth and

Adult Education (EJA), with special emphasis on the playful approach of the Tower of Hanoi.

The study adopts a descriptive approach, with the primary objective of discerning and thoroughly documenting the particularities of the research scenario under analysis. In this context, the main focus lies on obtaining a comprehensive overview that encompasses all relevant aspects of the research participants. This scope of analysis covers fundamental variables, such as age, gender, geolocation and socioeconomic stratification, according to the theoretical framework proposed by Gil (2021).

This study adopts a bibliographic methodological approach, as it uses sources such as books, magazines, articles, theses and legislation to build the theoretical framework. This approach is in line with the definition of Pádua (2012), which considers bibliography as a set of works prepared by different authors at different times, using in whole or in part existing sources.

RESEARCH SAMPLING AND INSTRUMENT

This research included 180 EJA students and 26 teachers from two public schools in situations of social vulnerability in the state of Bahia.

Total EJA Subjects	Quantity
Students	180
Professors	26
Schools	2

Table 01: Total of Subjects

Created by the authors themselves (2023).

With regard to sample selection for the study, as explained by Vergara (2010), a sample or population subset is a portion of the whole that the researcher chooses based on representativeness criteria. In this context, according to the perspectives projected by

Roesch, Becker and Mello (1999), the sample is an inheritance from a portion of the population that is considered representative, selected from the areas of primary research interest.

In this research, the instruments used for collection were a semi-structured questionnaire with 4 closed questions for EJA students and 3 open questions for teachers. In the specific case of this study, the questionnaire involved predetermined questions, and the choice of the form as an investigation technique was motivated by its ability to clarify the relationship between the delimited variables, confident for a more in-depth clarification on the topic investigated.

TABULATION PLAN AND ANALYSIS

The results were processed using Microsoft Excel software to create graphical representations in pie chart format, with the purpose of establishing connections between the floating variables in this item. The aim was to tabulate and analyze the data, adapting it specifically for the analysis of this study.

Once the information for each category was transmitted, the data went through the process of processing the units of analysis, taking into consideration, the semantic interpretation of its meaning. Subsequently, the information was observed for a descriptive treatment of measures, such as percentages. The results obtained were then organized into tables and graphs, allowing a refined analysis of the scientific data.

RESULTS AND DISCUSSION

Graph 1 addresses the question “Has the use of games in mathematics promoted learning?” bringing the following percentages:

Within this context, when in Graph 01, it was questioned about its reality while in Youth and Adult Education (EJA), the use of games

in the mathematics discipline has promoted learning, it is observed that 50% said that there is learning in EJA with the use of games, 11% stated that at times learning occurs through the use of games; 39% stated that there is no use of games to learn mathematics; 0% did not know how to inform, therefore, 61% of respondents, in addition to those who stated always and at times, understand that when considering their reality, at EJA, through the use of games in the mathematics discipline, there has been learning.

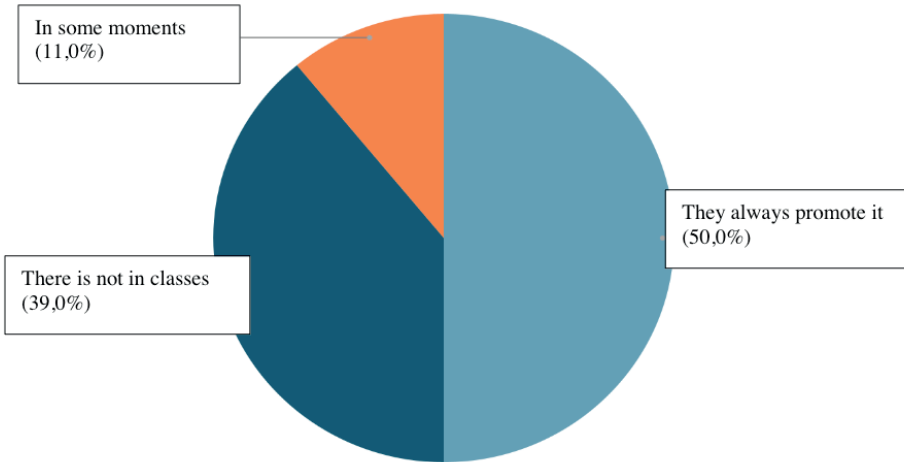
The justification for those who mentioned ‘sometimes’ is because they associated time outside of school and, therefore, learning, even with the use of games, has been a difficulty for assimilation. This evidence leads us to assume why 11% of respondents stated that it does not exist.

It was observed in the justifications that the students questioned do not know teaching with the game, in the subject of mathematics, through the Tower of Hanoi. In daily practice, learning mathematics, using the Tower of Hanoi game as a parameter for learning, has the main objective of contributing to learning, seeking to facilitate the introduction of content that is present in numerous mathematical applications in science and industry (Lima, 2013).

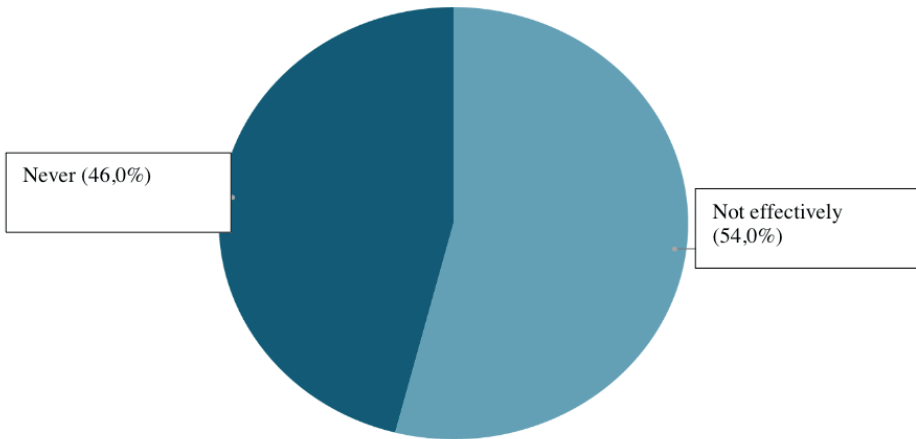
Such data also highlight the need for knowledge, above all, the openness of knowing about the game and its mathematical applicability, considering that students do not know the characteristics and gameplay of a hitherto unknown game,

Question 2 is “Did the teacher in mathematics classes mention the bases of the game considering the Tower of Hanoi?” providing the following data:

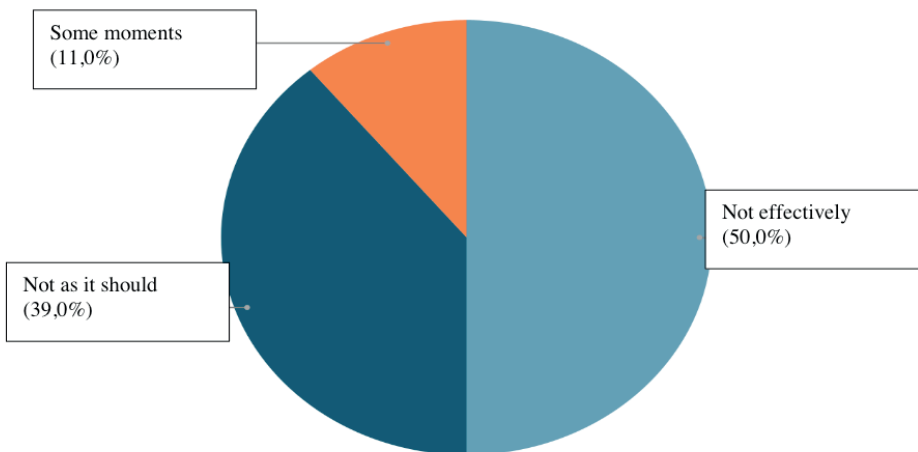
The data presented in graph 02, formulates the result of the investigation in relation to the importance of teachers mentioning to EJA students the bases of the game considering



Graph 01: Question 1
Prepared by the author herself (2023).



Graph 2: Question 2
Created by the authors themselves (2023).



Graph 03: Question 3
Created by the authors themselves (2023).

the Tower of Hanoi, and in this research 54% of respondents said yes, in an ineffective way and 46% said at no time, sometimes 0% and I don't know how to inform 0%, with both answers not being relevant to the survey. This understanding is in line with that described by Kishimoto (2017) when he states that games tend to develop students' ability to develop strategies in their daily lives, bringing solutions to the problems highlighted when interacting in the social environment in which they live.

The role of the educator is fundamental in the implementation of games based on the Tower of Hanoi, however, other questions arise in relation to the use of games in the learning context, specifically in relation to the effectiveness of this method. Education professionals need to reflect on whether the strategies employed have really contributed to understanding and, more importantly, to the goals they aim for when entering the job market.

This understanding of the job market is supported by theories such as Vygotsky (2014), who taught that learning development occurs through higher psychological functions, including games as an important instrument for this development, and Piaget, who stated that games they can promote assimilation and learning (Sant'Anna; Nascimento, 2011).

Question 3: "When learning mathematics at EJA, it is possible to promote knowledge through the use of the Tower of Hanoi game" brought the data:

Regarding the question whether in learning mathematics at EJA it is possible to promote knowledge through the use of the Tower of Hanoi's recreational base, the results in graph 13 show that 50% answered yes, but not effectively, 11% said that at times, 39% responded that they did not promote as they should and 0% said they did not know how to provide information. The challenge lies in

working with a future perspective without neglecting the immediate present, therefore, it is essential to understand the nature of classroom work in Youth and Adult Education (EJA) so that, in the future, it can be applied in a fruitful. This led to the investigation of students' agreement on the possibility of promoting knowledge of the subject of mathematics for Youth and Adult Education (EJA) through the use of the Tower of Hanoi's playful approach. Therefore, of those who responded, 89% said they agreed that it was possible to promote knowledge in learning mathematics for EJA students based on the Tower of Hanoi game, however, 11% were firm in declaring the opposite. In the school context involving Youth and Adult Education (EJA) students, as well as other regular education students, it is understood that skills must be designed beyond know-how.

In this scenario, the recommended idea of competence brought by Ferreira (2015) involves the integration of an action – which the game through the Tower of Hanoi provides –, which in the school context must not only aim at effectiveness, but mainly at learning.

The school contents, applied in Youth and Adult Education (EJA), for tomorrow do not mean giving up what they may mean today, however the understanding that the very attribution of meaning to the contents and knowledge acquired by them, in the present, from the use of a playful tool, the Tower of Hanoi game, will imply the role they will play in their future (Starepravo, 2010).

Education and learning, considering the game for Youth and Adult Education (EJA) students, are of fundamental importance because it facilitates their insertion into the job market, as already stated in studies by Silva (2014) among others.

The last question: "Tower of Hanoi: mathematics, learning and employability reducing social vulnerability" produced the

following data:

In the analysis of the answers provided by the students, represented in the graph, it is observed that 46% of them understand that learning mathematics with the Tower of Hanoi game, in many contexts, has the capacity to facilitate learning and promote insertion into the job market, 18% said very little, 36% at some points and I don't know how to say 0%, that is, everyone answered questions in a meaningful way.

It is clear that, while in the work environment learning is always oriented towards the logic of action, at school, the orientation must be more rational, seeking to promote understanding and intelligence of action, to mitigate the process of exclusion. Of those who mentioned 'at some moments', the justification lies, as previously described, in the approach to the educational issue considering other policies, in other areas, namely: infrastructure, employment and income, health, housing and others, as only in actions together, the issue surrounding social vulnerability can be minimized.

The issue of exclusion and failure to learn has played a significant role and leads to anxious attitudes of withdrawal, fear and rejection towards school on the part of students who drop out of mainstream education. From the perspective of Youth and Adult Education (EJA), school may seem inaccessible to them, however, the search to change their vulnerable situation in society is constant, as is the need for improvement to enter the job market (Lara, 2021). There are several aforementioned deprivations that Youth and Adult Education (EJA) students face.

The questions directed to teachers were divided into: "EJA and the teaching of Mathematics: Tower of Hanoi"; "EJA and teaching through the Tower of Hanoi" and "EJA and playful education". Teachers were identified with the letter P, specifically from

the number 1 to 14. The data is presented as follows:

Professors	Answers
P1; P4; P12; P13	Using games in teaching
P3; P6; P7; P11	Everyday math problems
P2; P5; P8; P10; P14	Expressive learning

Table 02: Question 1

Created by the authors themselves (2023).

Professors	Answers
P1; P4; P7	Teaching Mathematics
P5; P11; P14	Social inclusion = EP
P2; P6; P10, P13	Expressive learning and EJA
P3; P8; P9; P12	Situation of social vulnerability

Table 03: Question 2

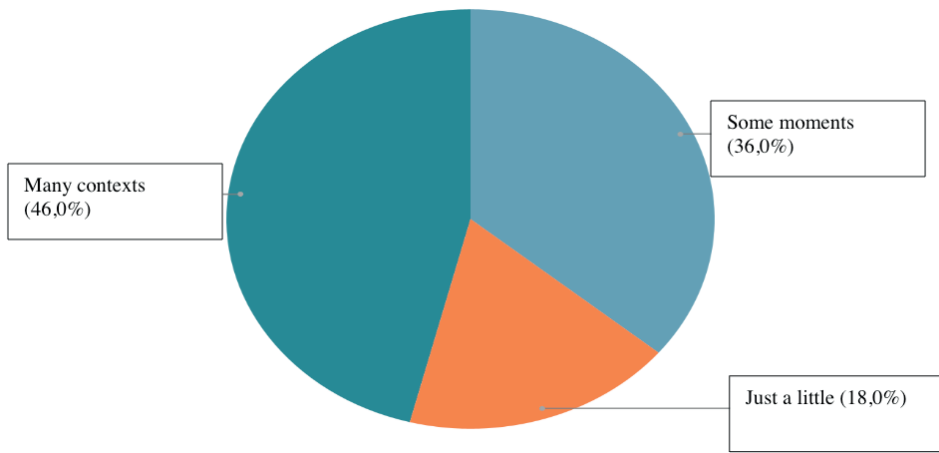
Created by the authors themselves (2023).

Professors	Answers
P4; P10; P13	Principles of the Tower of Hanoi
P3; P12; P14	More meaningful learning
P1; P5	Positive impact of playful teaching
P2; P7; P9	Exclusion of the situation of social vulnerability
P6; P8; P11	Tower of Hanoi

Table 04: Question 3

Prepared by the authors themselves (2023).

The responding teachers emphasize that the use of playfulness in Youth and Adult Education (EJA) requires a lot of effort and appropriate training, with differentiated and special attention for this contingent. However, as far as possible, the teachers surveyed highlighted that they are trying to bring the content as close as possible to the students' reality, returning to more technical training. It is important to highlight that, when considering this perspective, teachers understand that the return of this population



Graph 04: Question 4
Created by the authors themselves (2023).

to school does not mean a search to expand knowledge to get a job or a favorable position, but, mainly, to stay in their current job. Therefore, the importance around expressive learning, in teaching mathematics, covering aspects that involve their daily lives, however, in a playful way, precisely at this point, games like the Tower of Hanoi facilitate the absorption of dense content for a contextualized student audience and outside of regular education for a long time, asking and demanding from the teaching staff to change pedagogical approaches. At the Tower of Hanoi, the rules are previously defined, proving to be an excellent auxiliary tool, in the applicability and understanding of the empowerment content for students, above all, because they also enable the adoption and development of strategies that solve the problems proposed during the process. intervention (Ribeiro, 2012; Oliveira; Brim; Pinheiro, 2019).

CONCLUSION

This research addressed the importance of the Tower of Hanoi game as a pedagogical tool in Youth and Adult Education, aiming to promote meaningful mathematical learning in students in vulnerable situations in two schools in Salvador-BA. The relevance of the approach provided innovative strategies to improve mathematical learning by contributing to science by exploring meaningful educational alternatives.

The legacy includes the transformation of teaching, enabling vulnerable students to apply knowledge in a practical way, benefiting society. The research provides the researcher with valuable insights to overcome educational challenges in vulnerable adults.

The results showed that considering the Tower of Hanoi approach, the focus on memorization, which is excessive with mathematical expressions, outside the students' usual language, using it with

association with each student's daily life, allows for an improvement in teaching. and learning of EJA students, mainly because they have been away from the classroom for a long time. And, through play, it has been possible to show students their guaranteed rights, in particular regarding the process involving Professional Education (PE), coming, through the Tower of Hanoi, to enable these students to gain broader knowledge, with a focus on in subjects such as Mathematics.

Therefore, the objective defined here is to analyze the contribution of the Tower of Hanoi game as a means of achieving sustained and long-lasting learning of mathematics.

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