

Mathematics Teaching in Youth and Adult Education in Manaus

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ABSTRACT

Background: Youth and Adult Education (YAE) is a teaching modality aimed at young people, adults and older adults who need to complete their studies so that their specificities are respected within this teaching and learning process. **Objectives:** Analyse aspects related to mathematics teaching in the 3rd phase of Youth and Adult Education (YAE) through the continuing education of teachers who work in the segment, proposing new methodologies based on the results of the ADE (Student Performance Assessment). **Design:** The research carried out was of a qualitative exploratory nature, using psychometric theories as aids in the composition of the research, these being the classical test theory (CTT) and the item response theory (IRT). **Setting and participants:** From the universe of schools that compose the Semed - Manaus, a group of schools from the East Zone of Manaus was chosen; this choice was motivated by the fact that the area has the highest number of teachers (nine) who work in the 3rd phase of the YAE of Manaus. **Data collection and analysis:** The CTT/IRT was applied to the ADE, and the most difficult-level items were selected. For data collection, interviews, observation and application of forms on the Google Forms platform were used. **Results:** The research showed that teachers have many doubts regarding the curricular competencies that involve specific mathematics topics, mainly algebra. In the investigated group, none of the teachers had training in mathematics. Also, the textbook is not contextualised for the segment and does not include these new National Base skills. Schools also do not have digital resources to teach mathematics more playfully. **Conclusions:** Research shows that more mathematics training is needed for teachers in the segment. The Semed qualification sector needs to create a format aimed at YAE. Research is needed to assess the segment after the 3rd phase to verify the impact of mathematics teaching by teachers with no qualification in the area.

Keywords: Mathematics, Youth and Adult Education, Education.

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O ensino da matemática na educação de jovens e adultos em Manaus

RESUMO

Contexto: A Educação de Jovens e Adultos (EJA) é a modalidade de ensino destinada a jovens, adultos e idosos que necessitam concluir seus estudos de forma que suas especificidades sejam respeitadas dentro desse processo de ensino e aprendizagem. **Objetivos:** Analisar aspectos referentes à educação matemática na 3ª fase da Educação de Jovens e Adultos (EJA), através das formações continuadas para os professores que atuam no segmento, propondo novas metodologias com base nos resultados da ADE (Avaliação do Desempenho do Estudante). **Design:** A pesquisa realizada foi de cunho qualitativo exploratório, utilizando teorias da psicometria como auxiliares na composição da pesquisa, sendo estas a teoria clássica de testes (TCT) e teoria de resposta ao item (TRI). **Ambiente e participantes:** Do universo das escolas que compõem a Semed de Manaus, um grupo de escolas da zona Leste de Manaus foi escolhido, sendo essa escolha motivada pelo fato da zona possuir o maior número de professores atuantes na 3ª fase da EJA de Manaus, num total de nove professores. **Coleta e análise de dados:** Para a escolha dos itens, aplicou-se a TCT/TRI na ADE, selecionando os itens de nível difícil. Para a coleta de dados utilizaram-se entrevistas, observação e aplicação de formulários na plataforma *Google Forms*. **Resultados:** A pesquisa mostrou que os professores apresentam muitas dúvidas em relação às habilidades do currículo envolvendo tópicos específicos de matemática, principalmente de álgebra. No grupo pesquisado, nenhum professor tem formação em matemática, o livro didático não está contextualizado para o segmento e não contempla essas novas habilidades da Base Nacional. Além disso, as escolas apresentam poucos ou nenhum recurso digital para trabalhar de forma mais lúdica o ensino da matemática. **Conclusões:** A pesquisa mostra que são necessárias mais formações no âmbito da matemática para os professores que atuam no segmento. O setor de formação da Semed precisa criar um formato voltado para a EJA. É necessária uma pesquisa para avaliar o segmento seguinte a 3ª fase para verificar o impacto do ensino da matemática por professores que não possuem formação na área.

Palavras-chave: Matemática, Educação de Jovens e Adultos, Educação.

La enseñanza de las matemáticas en la educación de jóvenes y adultos en Manaus

RESUMEN

Contexto: La Educación de Jóvenes y Adultos (EJA) es una modalidad de enseñanza dirigida a jóvenes, adultos y adultos mayores que necesitan completar sus estudios para que sus especificidades sean respetadas dentro de este proceso de enseñanza y aprendizaje. **Objetivos:** Analizar aspectos relacionados con la enseñanza de las matemáticas en la 3ª fase de la Educación de Jóvenes y Adultos (EJA), a través de la formación permanente de los profesores que actúan en el segmento, proponiendo

nuevas metodologías a partir de los resultados de la ADE (Evaluación del Desempeño Estudiantil). **Diseño:** La investigación realizada fue de carácter cualitativo exploratorio, utilizando teorías de la psicometría como auxiliares en la composición de la investigación, siendo estas la teoría clásica de los tests (TCT) y la teoría de respuesta al ítem (TRI). **Ambiente y participantes:** Del universo de escuelas que componen Semed de Manaus, se eligió un grupo de escuelas de la Zona Este de Manaus, esta elección motivada por el hecho de que el área tiene la mayor cantidad de profesores (nueve) que trabajan en la 3ª fase de la EJA de Manaus. **Recopilación y análisis de datos:** Para la elección de los ítems se aplicó el TCT/TRI en el ADE, seleccionando los ítems de nivel difícil. Para la recolección de datos se utilizaron entrevistas, observación y aplicación de formularios en la plataforma Google Forms. **Resultados:** La investigación mostró que los docentes tienen muchas dudas con respecto a las competencias curriculares que involucran temas específicos de matemáticas, principalmente álgebra. En el grupo investigado, ninguno de los profesores tiene formación en matemáticas. Además, el libro de texto no está contextualizado para el segmento y no incluye estas nuevas habilidades de la Base Nacional. Las escuelas tampoco cuentan con recursos digitales para trabajar la enseñanza de las matemáticas de una manera más lúdica. **Conclusiones:** La investigación muestra que se necesita más formación en matemáticas para los profesores que actúan en el segmento. El sector de la formación de Semed necesita crear un formato dirigido a EJA. Se necesita investigación para evaluar el segmento posterior a la 3ª fase para verificar el impacto de la enseñanza de las matemáticas por parte de docentes que no tienen formación en el área.

Palabras clave: Matemáticas, Educación de Jóvenes y Adultos, Educación.

INTRODUCTION

Youth and Adult Education (YAE) represents the only opportunity for those to whom life denied the opportunity to go to school. In the meantime, we have the third phase of YAE in Manaus, in which students can have contact with the mathematical content of the fourth and fifth grades of elementary education. On the one hand, however, there are the specific contents of an axis that, under the light of the National Common Curricular Base (BNCC), gained more fields to be developed from mathematical concepts, such as algebra. On the other hand, we have teachers qualified in pedagogy who did not have access to these specific mathematics contents. In this scope, this research is important because it analyses the relationship between teacher, student, and mathematics teaching in a segment as full of specificities as YAE.

Freire (2014, p. 67) states that “the education imposed on those who are truly committed to liberation cannot be based on understanding men as ‘empty’ beings whom the world ‘fills’ with content”. In this sense, YAE

students cannot be treated as empty people with content to be filled. This research investigates aspects related to mathematics education in the 3rd phase of YAE, correlating the results of the Student Performance Assessment (Avaliação do Desempenho do Estudante - ADE) applied in Manaus and the curriculum addressed. Based on these results, the research intends to verify the existing problems in this relationship involving that generalist teacher and the teaching of mathematics, analysing this teacher's education and the contact he had with the component, tracing a parameter with this mathematical level and the new skills of the curriculum proposed in YAE in Manaus and by the BNCC.

As the basis of the work will use the ADE items, the research begins with the analysis of this material under the statistical aspect, bringing the classical test theory (CTT) and item response theory (IRT) as theoretical and statistical bases that support the choice of critical level skills. For this, the theoretical framework is based on authors who work on this analysis, with formulations and analysis of curves focused on large-scale assessment items, as shown in the ADE format.

The research methodology takes shape with the application of a questionnaire to identify teachers' difficulties and with continuing education through the formative workshops carried out with the teachers of the 3rd phase of the YAE in Manaus. Based on this, this research brings a detailed view of each workshop, checking each of the methodological procedures and their application, with subsequent analysis of the questionnaires applied to these teachers, showing how such analysis was necessary for the assembly of the material developed in the workshops.

The research ends with a general parameter of the YAE regarding the teacher's vision and the difficulties faced in the segment and, more specifically, concerning mathematics teaching, analysing the application of the curriculum to the students who compose it. Within this parameter, we hope to outline new proposals for public policies that improve youth and adult education in Manaus.

THEORETICAL FRAMEWORK

Historical context of YAE

According to Strelhow (2010), if we look at Brazilian education in the colonial period, it was specifically aimed at children, but "indigenous adults were also the object of intense cultural and educational action". The Society of Jesus (the Jesuits) had the primary function of teaching the natives of the

Brazilian colonies to read and write in Portuguese. With their departure in 1759, adult education collapsed, and the organisation and use of education were entrusted to the Empire. According to the author:

The identity of Brazilian education was then marked by the elitism that restricted education to the more affluent classes. The royal classes (Latin, Greek, philosophy, and rhetoric), with an emphasis on Pombaline politics, were specifically designated for the children of Portuguese colonisers (white and male), thus excluding black and indigenous populations. In this way, the history of Brazilian education was marked by a peculiar situation: formal knowledge monopolised by the dominant classes. (Strelow, 2010, p. 51).

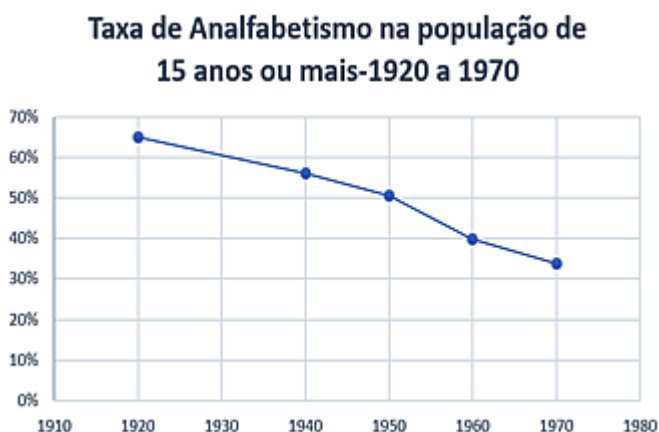
After the independence of Brazil in the imperial phase, according to Viegas and Moraes (2017), the first Constitution, created in 1824, was an important milestone in education. In the Constitution, D. Pedro I guarantees “primary education, free of charge to all citizens” Art. 179 (1824). This was considered an important advance within the Brazilian educational field. However, according to the analysis by Viegas and Moraes (2017), based on the work of Haddad and Di Pierro (2000), when one verifies the environment of the imperial, rural, and slaver Brazil, the concept of citizenship mentioned in the Constitution was a problem for young people and adults of the time. Haddad and Di Pierro (2000) state that in imperial Brazil, only a small portion of the population, the economic elite, were citizens and were assigned the task of administering primary education as a right from which blacks, indigenous people, and most women were excluded. Viegas and Moraes (2017) also point out that there was no quorum for free primary education, considering that it only applied to free white men.

From the 1940s, adult education became an educational public policy. According to Di Pierro, Joia, and Ribeiro (2001), some governmental programmes contributed to youth and adult education at that time. The National Primary Education Fund (Fundo Nacional do Ensino Primário), in 1942, the Adult Education Service (Serviço de Educação de Adultos - SEA) and the Adult Education Campaign (Campanha de Educação de Adultos), both in 1947 and the Rural Education Campaign (Campanha de Educação Rural), in 1952. According to Strelow (2010), since the beginning of the 1940s, youth and adult education has been on the rise. In 1946, the Organic Law of primary education was written, providing supplementary education. In 1947, as already mentioned, the SEA had the purpose of reorienting and coordinating, in

general, the work of the annual supplementary education plans for illiterate adolescents and adults. One of the reasons for the emergence of the first national literacy campaign was the immense international pressure to eradicate illiteracy in the so-called “backward nations”.

Figure 1

The illiteracy rate in Brazil. (IBGE, 2017)



With the 1946 Constitution enacted on September 18, in the full force of the government of President General Eurico Gaspar Dutra, it was in this letter that the expression “guidelines and bases” will be found for the first time, proposing them for national education. However, the specific reference to adult education is not in the body of the law, only a reference to those who were already in the labour market or minor workers. The 1946 Constitution still did not bring in its aegis, the YAE; the adult issue was only seen in the context of literacy. According to Leite (2013, p. 130), “the problem of illiteracy among adults was seen as a serious social problem, and campaigns dedicated to literacy and eradication of illiteracy began to emerge”. The graph in Figure 1 shows a fall in the number of illiterates between 1920 and 1970, but, according to the author, even in decline, the absolute numbers followed the growth of the Brazilian population.

According to IBGE data, in the 1940s, there were 23.4 million people, of which 13.3 million were illiterate, an expressive number that reinforces what

author Sandra Fernanda Leite says about the absolute numbers that accompany population growth at each historical stage. By analysing the data, it becomes clear that illiteracy continued in large proportions. Haddad and Di Pierro (2000) comment that the Brazilian state increased its responsibility for educating young people and adults from the 40s onwards.

Youth and Adult Education in Brazil

The Youth and Adult Education (YAE) (Educação de Jovens e Adultos - YAE) is formed by a large number of people who already enter the school environment with the feeling of failure either because they could not progress at school or because they dropped out, or any other personal, professional or financial reasons. Understanding that these students have a historical background burden is the first step in understanding who forms the YAE (Moreira, 2019).

According to Arroyo (2017), there is a shocking image in our cities: late afternoon, queues of teenagers, young people, and adults waiting for the bus to commute from work to the YAE centres. An even stronger image at night: queues of these same adults, young people, and teenagers waiting for the buses from these centres back to their neighbourhoods, slums, and remote districts. Late-night displacements from work to YAE and back to their distant homes.

When analysing the public that composes the YAE, according to Arroyo (2017), we must ask: What formative meanings do these people carry? How do these students interpret themselves, the school, and their environments? In the background, they carry a meaning concerning the school, what they seek, and their aspirations. According to Dalcastagne (2015, p.87), “looking from inside a bus, the city that those characters present us does not lose thickness or depth [...] it brings to the centre of the scene other places or, at least, places that are presented with new nuances”.

YAE sometimes becomes the last opportunity; it is the last chance for those who, for various reasons, could not advance in their studies. They are men, women, elderly, trans people, or semi-open regime inmates. In short, according to a prejudiced and exclusionary system, YAE encompasses all those who do not fit into the daytime stages that serve adolescents at the “correct age”. In other words, they are the ones that society prefers not to see, attending classes in remaining classrooms in buildings often forgotten by the public power but assisted by teams of teachers and pedagogues who resist pressure

from the Departments of Education to close their doors. Such organs reduce YAE to a column in a bar chart as an expense factor, as YAE classes usually have ten students (not fifty).

About this analysis, Freitas (2018) mentions that the contact with the students' stories always referred us to the opinion prepared by the Basic Education Chamber in the National Education Council (Câmara de Educação Básica/Conselho Nacional de Educação -CEB-CNE) that, at the turn of the lights of this new century, new paradigms were highlighted for older people's education in Brazil, besides the fact that the increase in life expectancy of Brazilians proportionally increases the need to expand their expectations related to the development of their potential (Freitas, 2018).

Older people who seek this modality are faced with significant obstacles: age itself, which is often seen as a factor that should prevent them from studying, in the face of prejudiced phrases such as "What do old people want to study for?" Those students who have considerable life experience are prevented from studying. Nevertheless, they have the right to have access to school, and society must support them, encouraging them to search for YAE centres.

YAE is a promise of life qualification for everyone, including older people, who have much to teach to the new generations. Freitas (2020) points out that according to IBGE data, most individuals cannot envision the possibility of returning to school benches, continuing their studies, and aiming to achieve new goals.

According to Arroyo (2007), it seems that youth, young people and adults have been segregated and stigmatised over the last few years. YAE came as a modality that should put an end to the dichotomies present in societies. Young people are more vulnerable than ever, YAE workers are less assisted, and the modality itself often boils down to a classroom on the night shift and a teacher who often seeks a third income. Allied to this equation is fatigue on both sides and the result can be a teaching-learning relationship in constant wear and tear.

YAE curriculum issues

According to Ribeiro (2001), the education system that works to teach literacy is failing the YAE audience. Thus, we should reflect on where this failure begins, evaluating the curriculum structures and how they work, to

mitigate this sad situation that today is composing the YAE rooms in Brazil, starting with the initial education of the teachers who work in the YAE. According to Rocha:

The discussion of specific formation for YAE educators is a topic that has been debated for decades. In 1947, the First National Campaign for Adult Education (Campanha Nacional de Educação de Adultos) was launched. This campaign already criticised teachers' inadequacy in working with this population. In 1947, at the First National Congress of Adult Education (I Congresso Nacional de Educação de Adultos), the specificities of educational actions at different levels and the need for specific formation to work with this audience were also raised. At the II Congress of Adult Education in 1958, these discussions gained more strength and visibility. (Rocha, 2008, p.45)

According to Arroyo (2007), when talking about a programme, a curriculum for forming educators for YAE, one cannot leave aside its history. We must make an effort to capture these pluralities, to incorporate these borders, these methods, and all these processes in which this educator was formed; then, one can see the importance of an education focused on YAE.

According to Fazzi (2007), there are still few studies and research on the curriculum issue in YAE. In most of the experiences and projects of YAE studied, the curriculum is based on official documents of regular elementary or high school; they are not documents directed to YAE. YAE teachers, without any other reference, resort to their own experience of working with children or adolescents in regular education. What often happens in schools is that teachers only have documents referring to daytime teaching, i.e., they use a curriculum for kindergarten or elementary and high school. The BNCC does not cover YAE, so, in this case, teachers seek skills designed for children and adolescents to prepare the curriculum for the segment. About the CNE/CEB 11/2000, Fazzi (2007) says:

Now, as YAE is a modality of basic education within the elementary and high school stages, it is logical that it should be guided by the same principles set out in the LDB. And about the curriculum components of its courses, it adopts the national curriculum guidelines for these same stages set out by CEB/CNE. Therefore, the guidelines for elementary and secondary education apply to YAE. The elaboration of other

guidelines could configure the creation of a new duality. However, this logical character does not mean direct equality when thought of in light of the sociocultural dynamics of the stages of life. At this moment, the age group responding to a specific otherness becomes a significant mediation for re-signifying the standard guidelines indicated. Subjection to CEB Opinions 04/98 and 15/98 and the respective Res. CEB n. 02/98 and 03/98 do not mean a contextualised reproduction, given the specific nature of YAE. The principles of contextualisation and recognition of personal identities and collective diversities constitute national guidelines for curriculum content. (Fazzi, 2007, p.106)

According to the CNE/CEB 11 (2000), the curriculum guidelines must be contextualised; that is, a team must study and analyse which guidelines fit within YAE reality, taking into account socio-cultural and regional aspects. In this sense, YAE cannot succumb to the immediacy that suffocates aesthetics, compresses the ludic, and prevents inventiveness.

According to Fazzi (2007), this opinion CNE/CEB 11/2000, with the care of a legal text that must be guided by universality and coherence within the education system at the same time, in which it links the curriculum parameters of the YAE to primary and secondary education, propose that schools exercise their responsible autonomy, using their intelligence, creativity, and sensitivity when preparing their YAE projects, covering the specificities of youth and adult education.

YAE teacher education

Dubar (2005) reinforces the idea that each subject has a history, a past that influences the construction of their identity. This means that this subject is not only defined in terms of their current partners in the practice field. Also, in terms of their personal and social trajectory, through the interpretative reading of that past and the anticipatory projection of their future, this thought comes to the fore to meet the concept that a teacher who works in YAE should have concerning their field of work.

The YAE students have a strong identity relationship with their personal experiences. Despite seeking theoretical knowledge, they bring with them a load of knowledge. According to Porcaro (2011), there is no essential identity in whatever the social field since all identities are denominations

related to a historical period and a type of social context. These identities, therefore, according to Dubar (2005), are social and language constructions that are accompanied, to a greater or lesser extent, by rationalisations and reinterpretations that sometimes make them pass for timeless essences.

As Porcaro (2011) analyses, regarding Dubar's studies (2005), social identity is not transmitted from one generation to another but rather built in each generation, taking the preceding categories as a reference. This identity construction is very important for the work and professional formation of the subjects, directly interfering in their educational practices, identities in motion, and this dynamic of dismantling/restructuring sometimes takes on the appearance of an "identity crisis". Each identity configuration today is a mix in which the old identities meet the new demands of production and in which the lasting, old logic combines and sometimes disputes with the new attempts at economic and social rationalisation. All these factors must be taken into account in teaching practice.

According to Caldera:

The teaching professional identity is not something that can be acquired definitively and externally. It is mobile and constitutes a construction/deconstruction/permanent reconstruction process, as each place and time demands these professionals' identity redefinitions. It is, therefore, a production process of the historically situated subject. It occurs, therefore, in a given social and cultural context in constant transformation, reflecting a complex process of appropriation and construction that takes place at the intersection between the teacher's biography and the history of social and educational practices, thus containing the marks of the most varied pedagogical conceptions. (Caldeira, 2000, p.2)

The identity of the professional YAE teacher is constructed as they experience what they do in the classroom; often, some pre-established ideas are modified and adapted according to the contact with the reality they encounter. According to Diniz- Pereira and Fonseca (2001), this identity is being constructed not only from the social relations that are established in the initial education programmes but mainly through the educators' contact with the teaching practice. According to the authors, the fact that educator assumes themselves as such, choosing a course that accredits them to exercise the profession, constitutes the first step towards constructing their teaching identity (Porcaro, 2011).

Mathematics teaching in YAE

Bitão and Ferreira (2015) state that mathematics teaching has always been based on repetition, on rote learning, in such a way that students were encouraged to memorise instead of understanding the process. Thus, students do not develop critical and interpretative reasoning that expand the learned concepts to different situations. An intense discussion that emerged from then on was using problem-solving in class.

Cembranel says:

The teacher's role, especially in mathematics classes, is to organise a favourable environment for action, experimentation, and exchange between children, creating situations that invite the child to establish relationships, quantify and build operations. (Cembranel, 2009, p. 8)

Dante and Oliveira (2009) affirm that mathematics is one of the most essential tools of modern society. In this way, the authors argue that appropriating its concepts and properties is the key for the citizen to be truly inserted in the world of work. Knowing how to count, compare, measure, calculate, solve problems and argue logically are some functions that must be part of teaching young people and adults. They see mathematics within a sociocultural context, for example, posing problems in the field of numbers for a YAE class considering their real-life context, thus contributing to improving the teaching-learning relationship.

As Leite argues,

It is necessary to characterise youth and adult education students as subjects of knowledge and learning and emphasise the need to know them well to work with them. The author states that this young person or adult, in most cases, is a migrant with a short and unsystematic passage through school, working in unskilled urban occupations, usually after working in the fields during childhood and adolescence. Most of the time, they are children of unskilled rural workers with a low level of schooling, generally illiterate, who seek later to become literate or attend some series of supplementary education. The author reports that adults are inserted in the world of work and interpersonal relationships differently from children and adolescents and bring along a longer and more complex life history. (Leite, 2013, p.170)

To Galvão and Soares (2005, p.51), “the adult is a producer of knowledge and culture and who, even though not knowing how to read and write, is inserted, mainly when he/she lives in urban centres, in effective literacy practices”. This statement is very relevant within mathematical literacy because, even though many adults do not know how to read, they manage to perform arithmetic operations within problems with an economic context. This is evident when the teacher teaches problems contextualising with everyday situations. Dante and Oliveira (2009) say that mathematics is present in practically all daily activities, with greater or lesser complexity; that is, in their work, the YAE student informally performs mathematical functions. They calculate, compare, and locate within their social context. The great work the teacher must do here is to try to bring this informal context that makes up mathematics from the personal environment to the school environment, i.e., the teacher must build this bridge using students’ previous knowledge, fine-tuning the work in the classroom, making them feel inserted within the mathematics that guides their lives.

According to Kooro and Lopes (2007), teachers working with mathematics in the education of young people and adults must understand the component as a socio-historically constructed science and must teach these students this concept, valuing their own and their student’s personal and cultural experiences as critical factors, so that the subject becomes more relevant and meaningful. Thus, students will learn more about reality, culture, and themselves, increasing their self-confidence. It is impossible to think of a teaching and learning process of mathematics outside the cultural context, considering only aspects of pure mathematics because this can generate a factor of failure, impairing students’ learning.

Student Performance Assessment (Avaliação do Desempenho do Estudante - ADE)

According to Manaus (2021), the Municipal Secretariat of Education of Manaus (Secretaria Municipal de Educação de Manaus - SEMED) incorporated into its organisational structure the Division of Assessment and Monitoring (Divisão de Avaliação e Monitoramento - DAM) to coordinate the School Performance Assessment System (Sistema de Avaliação de Desempenho Escolar -SAEDE) instituted by Ordinance n. 0324 (2009), which included the 2009 assessment of school performance and school management and other needs from 2013 to 2013.

In 2014, the Student Performance Assessment (ADE) was created, a predecessor project of the Municipal Department of Education of Manaus, to evaluate students' performance and help principals and teachers supervise the teaching process and analyse the results obtained.

The ADE of the 3rd phase of the YAE comprises 32 items, 16 of which are Portuguese and 16 are mathematics; all items are objective multiple-choice questions with four alternatives, one template, and three distractors. The elaboration process starts with the selection of skills from the ADE reference matrix, a document that has the skills of each segment. These skills compose the specification table, a kind of order matrix where the developer receives the skill, the level, and the feedback for each item. After preparing the items, the test is sent for an area and a pedagogical review and, finally, a linguistic review. The test with the two components¹, Portuguese language and mathematics, is applied only after the entire review process.

The ADE is applied twice a year to the municipal schools of Manaus. After application, the analysis team collects the data and, based on the CTT (classical test theory) and the IRT (item response theory), each item is analysed, and the expected levels and the levels obtained are compared. With such work, the analysts can produce a report that points out the skills in which, according to the ADE proposal, the schools advanced and indicates the skills in which the students have difficulties. These results are then sent to the Department of Educational Management (Departamento de Gestão Educacional - DEGE), which, through the Integrated Management of School Education (Gestão Integrada de Educação da Escola - GIDE), monitors work at the municipal schools, carrying out follow-up and actions that help teachers overcome the problems found.

Based on the results, the data obtained is shown in Table 1.

1 After preparation, the assessment undergoes an area review, referring to the specific component, then it is sent to a pedagogical review. After this process, the test undergoes a linguistic review and, finally, there is a general review where the entire team reads the test .

Table 1

Structure of ADE/YAE-3rd phase (Semed, 2021)

Axis	Number of Items
Numbers	10
Algebra	1
Geometry	2
Quantities and Measures	2
Probability and Statistics	1
Total	16

ADE assessments are prepared according to a reference matrix with the skills. According to Andrade (2011, p.3), “the reference matrix is the fundamental object of an assessment and brings together a set of descriptors that are associated between contents, competencies, and skills selected and ordered hierarchically according to curriculum relevance. Each descriptor relates a mental operation to a specific content of the curriculum, seeking to verify the cognitive level reached by the student in the areas of the evaluated knowledge”. Currently, DAM states that following the example of the BNCC, the term descriptor is no longer used but skills, in which case, the current matrices work with specific skills and components.

METHODOLOGY

According to Pesce and Abreu (2013), the research was qualitative, which deals with the concept of naturalistic generalisation. According to naturalistic generalisation, the value of the research product is perceived only because of the process. Therefore, the research findings are likely to be generalised only when related to situations such as the one studied. Given this scenario, the study carried out in this research sought to bring the reality of a representative group of YAE/ Manaus to outline substantial parameters related to the research theme and was approved at *Plataforma Brasil* under Opinion n. 5069953.

The research carried out was of an exploratory qualitative nature. According to Gil (2019), exploratory research aims to provide greater

familiarity with the problem, to make it more explicit or build hypotheses. Its planning tends to be quite flexible, as it is interesting to consider the most varied aspects related to the fact or phenomenon studied. We understand that exploratory research seeks proximity to the reality of the studied object through its methods and criteria, allowing greater familiarity between the researcher and the researched topic since this is still little explored.

The research was carried out in the city of Manaus, Amazonas, which has many 3rd-phase YAE classes. In Manaus, a large-scale assessment is applied to the YAE with data collection at the CTT/IRT level, targeting teachers who work in the 3rd phase of the YAE of Manaus in the East Zone 2 of the city. This division was carried out by the municipal Department of Education of Manaus due to the size of this region, which comprises the East Zone.

The first research stage was a literature review of work about YAE, designed so that the dissertation could bring sources and a theoretical scope to give grounds for the research topic. The second stage was a documentary analysis to trace the historical aspects that could build a scenario of the theme that would not remain restricted to a current scope but with an understanding of the entire context involving the process that guides YAE. The third stage was the analysis of the ADE items using the CTT and IRT theories to identify the *difficult* or *very-difficult* level items. The fourth stage of the research was preparing the formative workshops, which aimed to work on the skills that were presented as criticisms regarding the statistical analysis. Each workshop was prepared with resources applicable to YAE and methodological activities with teachers who work in the 3rd phase.

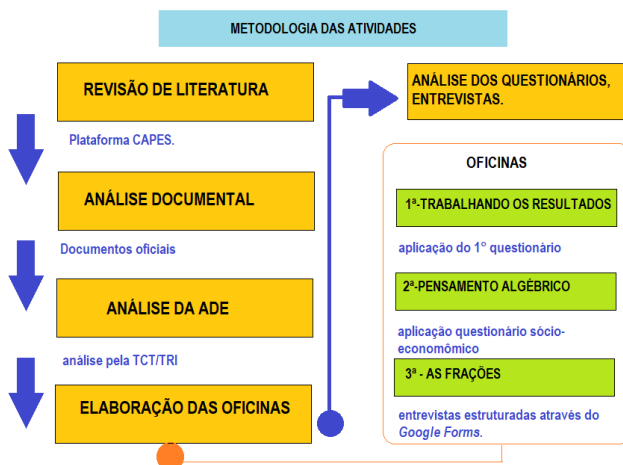
The last stage comprised the analysis of the questionnaires, interviews, and observations related to the workshops. The interviews and workshops focused on mathematics teaching, which goes through some aspects that consider teacher education and the curricular structure of the Municipal Department of Education in the YAE modality, emphasising the dialectical aspect.

The teachers of the 3rd phase of YAE must be qualified in pedagogy or higher *normal* school. They are also qualified to work in early childhood education (day shift). These professionals work from the 1st phase to the 3rd phase; in the 3rd phase, they end their participation, and from the 4th phase onwards, YAE has professionals qualified in specific areas. In these higher stages, the class time is divided into components. The present study focuses on professionals in the 3rd phase, who are generalist teachers who mostly do not have specific training in mathematics but teach the specific component.

According to Figure 2, for the analysis, we used the data obtained from the notes referring to the observations in each workshop, and the interviews, in which we verified the relevant points within the topic addressed, tabulating them in tables and graphs of the elements belonging to the socioeconomic questionnaire and some variables collected in the interviews. Besides, we used statistical analysis through CTT/IRT to choose the items, as it depends on several analyses involving percentage results and analysis of statistical curves.

Figure 2

Methodological stages



RESULTS AND ANALYSIS

Aiming to set up the workshops for 3rd-phase YAE teachers, we started an analysis of the first ADE-YAE-2021. Our analysis began using the DAM database, which counts on the results of the CTT and IRT curves. This analysis was based on the data provided by the DAM, as per the authorisation of process n. 2022.1800.18125.0.005605. Figure 3 presents the results obtained with the ADI (Acquired Difficulty Index) using the CTT/IRT parameters.

Figure 3

CTT/IRT-ADE Analysis result 3rd-phase-YAE (Semed, 2021)

Item	GAB	A	B	C	D	ADI	Skill
19	C	26.29	14.57	39.71	9.71	D ²	H13-Solve problems involving addition or subtraction with natural numbers.
20	B	8.57	25.43	18.29	36.86	D	H27-Identify the equation that models a problem involving addition, subtraction, multiplication, or division.
23	A	32.86	12.86	9.43	35.14	D	H24-Identify equivalent fractions
24	C	20.29	18.00	36.00	13.71	D	H15-Calculate the result of a division of natural numbers.
27	D	19.43	16.86	9.14	43.71	D	H12-Calculate the result of subtraction with natural numbers.
31	C	10.29	15.71	30.86	31.14	D	H29-Associating and naming spatial geometric figures to objects in the physical world.

The first workshop, with a two-hour workload, was held on March 18, 2022, at the East II District Division Zone (DDZ) headquarters. It was planned based on the results of the 2nd ADE of the 3rd phase of the YAE of 2021, supported by DAM (Division of Assessment and Monitoring), GYAE (Gerência da Educação de Jovens e Adultos/Management of Youth and Adult Education) and the Coordination of DDZ East 2, with prior disclosure to the teachers who compose it.

Seven out of the nine teachers estimated were very receptive to the workshop. At first, we explained the reasons that led to the workshop, followed by a presentation of the master's degree research project. Then we presented the results, which included moments that interspersed the resource in the presentation and the methodologies and concrete resources that can be used in the future teaching plans of the YAE teachers.

The workshop began with the presentation of the items that, according to the CTT/IRT, presented a difficult level for the participants in the assessment. The items showed success and error rates. Within this analysis, the different possibilities regarding the hypotheses of each distractor were explored.

The second workshop was designed to work on the skills of the 3rd phase curriculum with the Algebra axis. For this, we first prepared a booklet with the skills of the axis, where all of them were worked on with exposure to

2 D-indicates Difficulty level according to the IRT.

the content, exercises, and complementary activities. The handout would be used as a basis for distance activities and the studies that teachers should do. As requested by the participating teachers, the last meeting addressed skills involving fractions.

The socioeconomic questionnaire took place through the *WhatsApp* group because the contact with the teachers was only during the night shift due to the distance from the district zone and because in the counter shift, most worked with other segments. The teachers were given one month to answer the partner questionnaire and the interview so they would not get short of time. Nine out of the 12 participants answered because the activities are part of a distance-learning task they must accomplish for certification. Three were on leave.

The research pointed out that the teachers who participated in the research are, on average, 46 years old and have been teaching for an average of 17 years; most of them work 60 hours a week, i.e., in three shifts. The data revealed that they represent 55.5% of the participants. They face the heaviest workday, and the night closes their workload with a particular audience, the YAE students. The survey also revealed that all are statutory, and most work in the initial years during the day, dealing with literacy up to the 5th grade.

One of the points of analysis of the workshop is related to the fact that some teachers teach mathematics but are not qualified in the area. One of the questions in the questionnaire refers to investigating the YAE teachers' areas of qualification.

Table 2

Teachers' area of expertise.

Participant	Degree	Postgraduation
P1	Pedagogy	None
P2	Pedagogy	None
P3	Pedagogy	Poverty and Citizenship
P4	Higher Normal	Educational Guidance
P5	Pedagogy	Higher Education Teaching
P6	Pedagogy	School management
P7	Languages and Literature	Child education

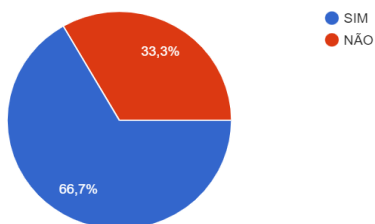
P8	Higher Normal	None
P9	Higher Normal	Educational Media

Table 2 shows that no teacher is qualified in mathematics. Teacher P7 has initial education in language and literature; three teachers graduated without specialisation –two in pedagogy and one in higher normal. One of the inquiries is how these teachers who work with such a specific audience manage to transpose such specific content as mathematics. It is worth mentioning algebra which, during the workshops, generated many questions involving very particular topics. In this case, continuing education is necessary to provide these teachers with these skills. During the workshops, we observed that the teachers are interested in studying mathematical topics but need this formation from the headquarters, focusing on youth and adult education.

School dropout is another problem faced by YAE. This problem directly affects the quality of teaching, especially on the night shift. The causes are as diverse as possible; however, what can be analysed is that, according to the participants, the number of school dropouts is significant, as shown in Figure 4.

Figure 4

Was there any dropout student in your class?



We see in Figure 4 that 66.7% of respondents answered “yes”. In question 6, when asked what would be the causes for evasion, the respondents said:

P4: Remote class. School reform.

P6: They didn't show up since the beginning of the year.

P8: Time incompatibility, physical and mental fatigue, heavy working hours, family problems, etc.

P9: City changes, health problems, and time difference with work.

Participant P4 highlights the problem of remote classes because, in the municipal schools, a project called “Aula em Casa” (Classes at Home) was prepared so that classes would be recorded for early childhood education, including recordings of all the specific components. However, the Department of Education did not plan classes aimed at YAE. So, the teachers of the 3rd phase used the classes aimed at the fourth and fifth grades. This fact verifies what we already said about the infantilisation of YAE; we can see that the classes have contexts loaded with materials for children. In this way, how does an adult or older person feel when watching classes aimed at children?

The answer is in P4's speech. The participants say that many students could not adapt to the remote system, which already presented a whole specificity for the public for which the classes were intended. We imagine what it must have been like for older people, adults, and young people that could not access the internet, mobile connection and day-shift class schedules when most YAE students are at work.

Regarding the interviews, participants were asked if there was any difficulty with the SEMED curriculum aimed at YAE, about which we highlight the lines:

P2: Yes, in some cases, mainly the notion of algebra, which is new.

P4: Yes. Appropriate didactic material.

P5: Sim. The lack of a textbook.

P9: Sim. Students do not follow the contents proposed for the stage.

During the workshops, we noticed that a recurrent speech of the teachers was related to some skills of the YAE curriculum. They claimed that most of the objects of knowledge coming from the algebra field were unknown to them and that it was difficult to transpose the content for students in the 3rd phase. Teachers P9 and P2 claimed that the curriculum was not aligned with

the reality of YAE. Another important factor was that they also claimed that the presentation of some skills was confusing, for example:

(EF04MA12) Recognise through investigations that there are groups of natural numbers for which divisions by a certain number result in equal remainders, identifying regularities.

(EF05MA10) Conclude through investigations that the relationship of equality between two members remains when adding, subtracting, multiplying, or dividing each member by the same number to build the notion of equivalence.

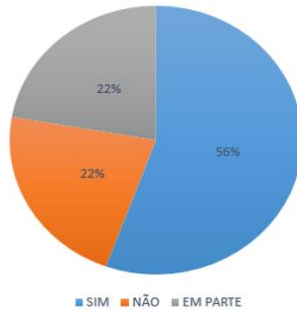
The first doubt was that the skill (EF04MA12) brings more than one object of knowledge, given that students would have to master the division with a proficiency that is often not achieved in the 3rd phase and observe the sequences, besides analysing the remainders. When presented on the chart, we can infer a great concern on the teachers' part regarding this skill, as they claimed to find it difficult because they did not receive satisfactory follow-up during the pandemic.

Reiterating what was questioned through *Google Forms*, the teachers reaffirm that the four operations are essential for the 3rd phase. Only one teacher mentioned geometry and algebra. However, he did not mention the specific contents of each axis. On the other hand, they mentioned the resolution of problems within the four operations, inciting a reflection on the curriculum and its application. Figure 5 presents the teachers' difficulties with the curriculum.

From Figure 5, we can infer that teachers have difficulties with the curriculum, which leads us to reflect on the skills of other axes, such as algebra, as claimed by teacher P2, who states his difficulty with specific contents involving the axis. This problem may be related to his initial education. Teachers P3 and P4 claim that the lack of adequate didactic material for YAE is a reality in our educational system. Little is seen concerning didactic material focused on this segment, and teacher P9 states that students do not follow the contents proposed for the 3rd phase. Several factors contribute to this situation involving the YAE curriculum, which presents a format that only brings a clipping of the BNCC, given that foundational skills are developed for the whole school year in each grade, with the content distributed throughout the year. In phase 3, students should see a set of skills from the 4th and 5th grades. Therefore, selecting these skills should consider this aspect, given that the BNCC focuses on teaching students who have one year to develop each skill.

Figure 5

Do you experience difficulties with SEMED's proposed curriculum for the 3rd phase of YAE?



CONCLUSIONS

This research allowed us to verify that YAE needs greater attention on the part of the Municipal Department of Education of Manaus regarding the continuing education of teachers with mathematics themes primarily, considering that most teachers of the third phase of the YAE teach mathematics without being qualified in the area, requiring continuing education to meet the specificities of the modality. It is necessary to bring to this teacher concepts integrated with methodologies focused on teaching young people and adults.

Teachers claimed to have difficulties with specific mathematics skills, given that many of the new BNCC skills bring objects of knowledge specific to the mathematics area, which, taking into account that these teachers did not have access to these objects of knowledge in their initial education -or, if they did, it was insufficient for them to have autonomy in the development of the teaching and learning process- causes difficulty in the relationship between teaching and learning.

Algebra was the axis with which the teachers presented the most significant difficulty in understanding concepts in the workshops, which requires greater attention to the skills related to this axis. We also understand that one should not only work on methodologies but also develop concepts and skills, exploring what is contemplated in each according to its context. In this case, it is up to the formative sector that operates with this level of teaching to explore the field of algebra, bringing these skills to the reality of teachers who work in YAE.

The teachers were receptive to the workshops but made it clear that it was due to its format, working first on the skills in which they felt difficulty and not with random themes. This claim was one of the resistance factors to the continuing education offered by the Department of Education through the formative sector. Teachers want qualifications and workshops that are aimed at the YAE audience instead of children or daytime teaching.

According to the research, there must be investments in the elaboration of specific material aimed at YAE, considering that, according to the teachers, the books available for the segment usually do not meet the reality of the students, and many of the teachers do not use them. Concerning this material, teachers also say that algebra skills, for example, are not covered in most collections. Thus, we suggest that resources focused on a regional context aimed at the segment are prepared.

Dropout rates in YAE are a concern in night schooling and often harm the teaching-learning relationship. The reasons range from physical fatigue to work-related issues, requiring a reflection on the part of the Department of Education about developing policies that encourage student adherence in the modality, where teachers report a feeling of abandonment regarding YAE.

The YAE curriculum must be revised. It is confusing regarding skills; texts are often long and with skills that are beyond the reality of the segment and the public for which it is intended, confusing students and teachers, who found it difficult to interpret some skills in Numbers and Algebra fields, for example.

The ADE is an essential assessment instrument because, through the analysis of its items, it was possible to assemble a general picture with the critical skills in which the students had a low rate of correct answers, and these were directly related to the skills in which the teachers presented difficulties. The work of the DAM through the ADE must be expanded, reinforced, and its results disclosed.

The YAE modality needs to be seen as a segment that deserves special attention regarding its specificities, making it rich in research. Therefore, there must be public policies focused on YAE, with a curriculum that considers its specificities, and the development of a specific didactic material, elaborated using the regional context, making learning more meaningful for the YAE student.

AUTHORSHIP CONTRIBUTION STATEMENT

BTOR came up with the idea on the research topic, BTOR and CLOG performed the topic conceptualisation; CLOG performed the data curation, BTOR performed the article data analysis, CLOG performed the data analysis review, BTOR performed research and data collection data, CLOG carried out the research methodology to be followed in the work, BTOR carried out the psychometric analysis of the items using CTT and IRT. BTOR created the initial text, and CLOG carried out the final revision of the work.

DATA AVAILABILITY STATEMENT

Data supporting the results of this study will be provided by the corresponding author, BTOR, upon reasonable request.

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