ATLAS.ti® in qualitative research: Expanding horizons in oral history analysis

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ABSTRACT

This article aims to explore the importance of the ATLAS.ti® software as an essential tool in the field of qualitative research, specifically in oral history studies focused on thematic analysis. The functionality of ATLAS.ti® in the collection, organization and analysis of qualitative data is highlighted, illustrating its effectiveness through a practical case. The focus is on the way in which software contributes significantly to the preservation of the integrity of narrative data and the promotion of the generation of scientific knowledge. The methodology used for the collection and analysis of personal narratives is strongly based on the use of ATLAS.ti®, which is aligned with the Oral History techniques of Holanda and Meihy (2015). This software not only simplifies the organization and categorization of data through the coding of themes as per Braun and Clarke (2006), but also improves the analysis of interviews with detailed accuracy. It enables the creation and synchronization of networks of codes, improving the visualization of connections between themes and aiding in the discovery of important insights and connections. In addition, its functionalities include linguistic analysis and the synchronization of textual transcriptions with audiovisual files, enriching the research with paralinguistic nuances. Despite an initial learning curve, ATLAS.ti®'s capabilities are essential for systematic and detailed qualitative research, evidenced by preliminary results that highlight its effectiveness in capturing deep connections and the importance of collaboration with skilled research assistants to maximize the benefits of the software.

Keywords: ATLAS.ti, Qualitative research, Oral history, Thematic analysis, Education, Software.

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INTRODUCTION

In the realm of modern scientific research, qualitative research rises as a fundamental paradigm in the exploration of complexities inherent in social, cultural and human phenomena. This type of research, characterized by its interpretative and contextual depth, requires methodologies that transcend simple data collection, demanding meticulous procedures of organization, detailed analysis and rigorous interpretation. The emergence of technological advances, particularly in the development of specialized software, has represented a significant milestone, providing researchers with tools that amplify the precision and analytical depth of qualitative studies.

Within this evolving technological landscape, ATLAS.ti® stands out as preeminent software for researchers seeking a sophisticated tool for the manipulation of non-numerical qualitative data. This application offers a range of features designed to optimize processes of encoding, querying, retrieving and analyzing vast volumes of data, whether textual, graphic, auditory or visual. ATLAS.ti®'s ability to adapt and integrate with various investigative methodologies consolidates it as an indispensable resource in the set of methodological tools of the contemporary researcher.

Thus, this article aims to explore the importance of the ATLAS.ti® software as an essential tool in the field of qualitative research, specifically in oral history studies focused on thematic analysis. Through a case study, it is intended to illustrate the functionalities and advantages of the software in the treatment of highly complex qualitative information. The synergy between the technological tool and the methodological strategy is examined, highlighting how the use of ATLAS.ti® can enrich the research process and contribute to the elaboration of deep conclusions and consistent results.

The research is developed on the collection of personal narratives, based on oral history according to authors such as Holanda and Meihy (2015), Thompson (2002) and Portelli (2012), which are submitted to a thematic analysis following the techniques proposed by Braun and Clarke (2006), assisted by software, allowing the identification of patterns, themes and emerging categories essential for the understanding of the meanings and perspectives of the participants. Through ATLAS.ti®'s networking functionality, connections are established between the identified themes, facilitating the visualization of the conceptual structure underlying the data.

The study emphasizes the importance of ATLAS.ti® in preserving the integrity of qualitative data, ensuring the faithful representation of participants' voices throughout the investigative process. In addition, the potential of the dialogue between researcher and software to promote a critical reflection and a deeper analysis of the collected data is discussed, culminating in the generation of high quality scientific knowledge.

THE SOFTWARE ATLAS. TI®

Originating in Germany in the late 1980s, ATLAS.ti® was conceived and developed by Thomas Muhr at the Technical University of Berlin in response to the growing need to analyze large volumes of qualitative textual data efficiently. This need arose due to the limitations of the manual methods of coding and analysis existing at the time, which proved to be insufficient for the treatment of complex and voluminous data.

Initially, ATLAS.ti® was proposed as a solution to facilitate the organization, coding, and extensive exploration of large text corpora. However, during the 1990s and early 2000s, the software underwent a significant expansion in its scope. The development team has enriched ATLAS.ti® with functionalities that encompass the analysis of multimedia data, marking a crucial evolution that has made it possible to include audio, video and graphic elements as analyzable materials, in parallel with traditional texts. This innovation has allowed researchers from a variety of disciplines to access and analyze a broader spectrum of data sources.

Qualitative research methodologies have experienced a direct and significant impact with the introduction and evolution of ATLAS.ti®. This software has established itself as an indispensable tool for conducting in-depth and multifaceted qualitative analyses, demonstrating particular effectiveness in methodologies such as Grounded Theory, content analysis, discourse analysis, and thematic analysis. The use of ATLAS.ti® in qualitative research has redefined the possibilities of interpreting and understanding data, significantly enriching the analytical landscape.

Notwithstanding its wide range of functionalities and notable contributions to the field of qualitative research, ATLAS.ti® presents challenges, such as a steep learning curve and potential technological dependence on the part of researchers. In some cases, the need to recruit research assistants to handle the software efficiently reflects that, despite its power, mastering its use can require a considerable investment of time and dedication.

Today, ATLAS.ti® aligns with the digitization trends of qualitative research, offering support for cloud computing functionalities, team collaboration, and integration with other digital tools. This support extends to the ability to capture and analyze data from social media platforms and the management of theoretical references, positioning the software as a contemporary solution adaptable to the dynamic demands of qualitative research in an increasingly interconnected era.

The ATLAS.ti® software allows the improvement and refinement of the emerging research themes. The researcher, by using this tool, is able to carry out a careful review of the previously identified codes and themes, thus operationalizing a process of restructuring and redefinition that is necessary to ensure that the proposed themes are in line with the data collected and with the objectives of the study.

In addition, ATLAS.ti® offers resources for the registration and organization of the researcher's analytical reasoning. The use of memos and annotations proves to be a prominent feature, as it enables the documentation of impressions, methodological decisions and critical reflections on the progress of the work. This practice contributes to the transparency and traceability of the analysis process, which are fundamental for the credibility of the results obtained.

In addition, ATLAS.ti® has mechanisms for the safe and efficient storage of the project file, which encapsulates all the collected material. The possibility of cloud storage is especially relevant, not only because of the security and ease of access it provides, but also because it makes it easier to share the research data with other analyzers. This feature of the software is particularly important for studies that require validation and peer review, ensuring that the analysis process can be independently reviewed and validated, which is a crucial aspect for the validity of scientific research.

In the context of qualitative data analysis, the ATLAS.ti® software stands out for its graphical visualization of data, allowing the researcher to explore the interrelationships between different themes and emerging concepts. Through networks and diagrams, it provides an elucidative view of the collected narratives, with visual representations that can be adjusted and customizable according to the needs of each study. This adaptability is crucial for discerning patterns, trends, and connections that might otherwise go unnoticed in superficial analysis. The integration of ATLAS.ti®'s annotation and encoding functionalities into graphical representations enriches the analysis, revealing the complexity of the data.

The value of ATLAS.ti® lies in its ability to provide the researcher with an interactive and intuitive work environment, where data manipulation becomes a powerful tool for in-depth qualitative research. The expanded understanding of the relationships and structures present in the dataset is, therefore, a direct consequence of the use of these advanced visual aids.

The coding and thematic organization enable a richer and more multidimensional apprehension of the data, while the visualization of patterns helps in the identification of links and trends that are fundamental for the understanding of the phenomenon studied. Therefore, these capacities are important for the production of qualitative knowledge that is both rigorous and meaningful, consolidating it as a valuable resource for the present study, providing a sophisticated means for the exploration and interpretation of the complexities that characterize qualitative data.

Finally, ATLAS.ti® enhances thematic analysis, offering a set of features that help in the management, interpretation and presentation of qualitative data in a systematic and replicable manner. The adoption of the software, therefore, not only facilitates the analytical process, but also contributes to the elaboration of a qualitative study with high standards of quality and methodological rigor.

ORAL HISTORY AND THEMATIC ANALYSIS

The investigation adopted Oral History as a method, recognized for its effectiveness and valued by influential academics such as José Carlos Sebe Bom Meihy, Paul Thompson and Alessandro Portelli. Meihy, distinguished for his studies on social phenomena in the context of colonization at UNIGRANRIO, and Thompson, a pioneer in the integration of Oral History in sociology with his work "The Voice of the Past: Oral History" (2002), established solid foundations for its application in qualitative research. Portelli, for his part, explored the nature of memory and historical significance, highlighting the literary character of Oral History.

In the specific scope of the study, which explores personal experiences in an educational institution, the method was employed following the guidelines of Garnica (2005) and Holanda and Meihy (2015). Thematic analysis, according to Braun and Clarke (2006), is a method that identifies, analyzes, and reports patterns or themes within data. ATLAS.ti® serves as a powerful tool to assist in both processes. To this end, the software has features that allow researchers to organize, codify and analyze large volumes of qualitative data in an efficient and systematic way, making it possible to import various types of data, such as texts, images, videos and audio files, facilitating work with different content formats.

Thus, the use of the software for thematic analysis with a focus on historical narratives was structured in clear and simplified stages, facilitating the analysis process through the following themes, created *a priori*, according to the context investigated.

THEMES & CODES

Theme 1: Interdisciplinary Practices in Mathematics Teaching

Curricular Integration: According to Morin (2001), mathematics integrated with technical disciplines, such as agriculture, forms a learning structure that highlights the interconnection between disciplines, promoting a more holistic and relevant learning.

Teaching Methodologies: The adoption of methodologies that transcend traditional disciplinary boundaries, focusing on projects that promote meaningful learning, as discussed by Morin (2001).

Projects and Activities: Descriptions of projects or activities that exemplify interdisciplinarity, showing how mathematics operates in conjunction with other areas of knowledge.

Challenges and Barriers: The difficulties faced in implementing interdisciplinary practices, including institutional resistance and difficulty in modifying established curricular structures.

Theme 2: Contextualization of Mathematics in Everyday Life and in the World of Work

Practical Applications: Discussion on the application of mathematical concepts in real agricultural situations, as discussed by D'Ambrosio (2009), who emphasizes the importance of connecting mathematics to students' daily lives.

Professional Relevance: The importance of mathematics for future careers in agriculture and how it motivates students, based on the ideas of D'Ambrosio (2009).

Contextualized Teaching Strategies: Techniques to contextualize the teaching of mathematics, making it relevant and stimulating for students, inspired by the work of D'Ambrosio (2009).

Theme 3: Inclusive Education

Inclusion Strategies: Strategies to meet the needs of students with diversity, according to approaches proposed by Mantoan (2015).

Student Feedback: The importance of considering student feedback in order to continuously improve inclusive practices.

Inclusive Learning Resources: The use of learning materials tailored for inclusion, reflecting a commitment to diversity and access to knowledge for all learners.

Theme 4: Pedagogical Impact of Teaching Practices

Pedagogical Contributions: Reflections on teachers' contributions to interdisciplinary and inclusive teaching.

Evaluation and Feedback: The importance of evaluation and feedback to measure the success of teaching practices.

Professional Development: The need for continuous professional development of educators to stay current and respond effectively to educational demands, as highlighted by Mantoan (2015).

Theme 5: Teachers' Perceptions and Experiences

Motivations for Interdisciplinary Practices: The reasons for adopting interdisciplinary approaches, based on the personal experiences of teachers.

Personal Experiences: Teachers' personal stories and experiences related to interdisciplinary and inclusive teaching.

Vision on Inclusive Education: Teachers' opinions and beliefs about inclusion in technical education.

Theme 6: Challenges and Opportunities

Obstacles in Inclusive Education: Specific challenges faced in the context of inclusive education.

Opportunities for Improvement: Suggestions for improving teaching practices.

Institutional Support: The importance of institutional support in facilitating or obstructing pedagogical innovation initiatives, discussed by Santos and Almeida (2018).

METHODOLOGY

In the present research, we employed a qualitative methodology as described by Lüdke and André (1986), focusing on the direct interaction between researcher and school environment to capture nuances of the educational context and pedagogical practices. Oral History, endorsed by theorists such as José Carlos Sebe Bom Meihy, Paul Thompson and Alessandro Portelli, was chosen as the main methodological tool. Thompson (2002) and Portelli (2012) emphasize the ability of this approach to capture the essence of human experiences, valuing interpretation and meaning over the exact accuracy of historical events.

Data were collected exclusively through interviews, favoring this method for its ability to provide a deep understanding of the participants' perceptions and experiences, as indicated by Creswell (2010) and Thompson (2002). This methodological choice stands out for allowing a detailed and humanized exploration of the phenomena studied.

During the data collection phase within qualitative research, the investigator is faced with the challenge of not only collecting the necessary information, but also preparing it in a way that facilitates subsequent analysis. This process begins with structured interviews, which are recorded to ensure the fidelity and integrity of the information provided by the participants (Thompson, 2009). These recordings, due to their perennial nature, are valuable because they capture the richness of the experiences and perceptions of the interviewees, constituting the core of the empirical material to be examined.

After the collection stage, the audiovisual recordings obtained are subjected to a detailed transcription procedure. Transcription is a critical step as it converts speech nuances, contextual details, and linguistic expressions into written text, enabling deeper analysis of the content. In the current study, transcriptions are not performed manually or through third-party services, but rather through the application of a programming script using Google's Whisper® library.

The script in question was created to optimize the transcription process, ensuring that every word spoken by the participants is captured accurately. This automated procedure not only saved significant time that would otherwise be spent on manual transcription but also reduced the possibility of errors, ensuring greater reliability of the transcribed data. Accuracy is of paramount

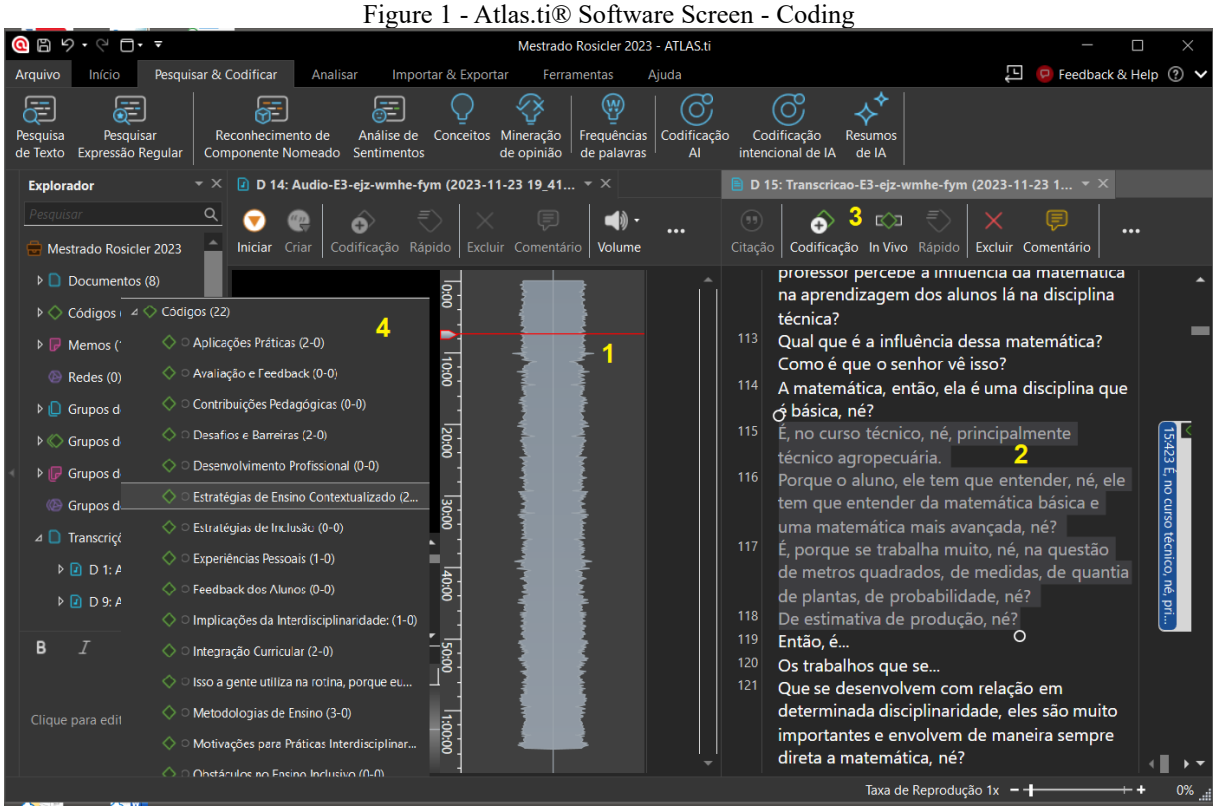
importance, as any discrepancy in the transcript can lead to misinterpretations during the data analysis phase.

Once transcribed, with the proper timestamps, the interviews are imported into the ATLAS.ti® software which has as one of its efficiencies, the ability to import the transcriptions carried out in an effective way, along with the ability to aggregate the original audio and video files and synchronize them with the transcription.

The import of the data into ATLAS.ti® allows the researcher to synchronize the textual transcriptions with the specific moments of the recordings, enabling a richer and more detailed analysis. This function is particularly useful for the analysis of non-verbal and paralinguistic aspects present in the interactions, such as pauses, intonations and gestures, which are crucial elements for the full understanding of the communicative nuances present in the interviews. After data collection, they are imported into the ATLAS.ti® system, inaugurating a crucial phase in the investigative process: analytical coding. Codification, within the scope of Thematic Analysis, is a task that demands a careful and reflective reading of the textual corpus, a process during which the researcher identifies and marks excerpts that highlight key concepts or themes pertinent to the scope of the investigation. This marking is carried out by means of 'codes', which are symbolic labels used to represent ideas and themes emerging from the text (Braun; Clarke, 2006).

ATLAS.ti® software is equipped with tools that optimize and refine the coding process. The *in vivo* code creation functionality allows the researcher to select segments directly from the transcribed text, as shown in figure 1, assigning them codes that are often derived from the participant's own lexicon, thus preserving the essence of the original discourse. Alternatively, the option adopted was the definition of a *priori* codes, established based on the pre-existing theoretical framework or on hypotheses outlined prior to the analysis.

Figure 1 - Atlas.ti® Software Screen - Coding



Source: Prepared by the author (11/2023).

Figure 1 shows that the encoding occurs in a transcribed and synchronized excerpt (1). The Researcher selects the excerpt (2) and applies the code (3), selected from the list of codes defined *a priori* (4).

As the coding process progresses, ATLAS.ti® makes it easier to identify patterns and emerge recurring themes. This is made possible by both the intuitive nature of the software's interface and the analytical capabilities it offers. One of these features is the ability to group semantically related codes into 'code families', which helps in structuring and hierarchizing the thematic and sub-thematic categories that emerge throughout the analysis. Through these resources, ATLAS.ti® offers the researcher the possibility of carrying out a deep, systematic and rigorous thematic investigation, in accordance with the requirements of contemporary scientific methodology.

ATLAS.ti® also provides a 'concept cloud' feature, which graphically visualizes the frequency and relevance of the codes, enabling an immediate understanding of the predominant themes. In addition, the software has advanced search and retrieval mechanisms, which allow the researcher to quickly and accurately access all text excerpts linked to a specific code or theme.

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FIELD OF RESEARCH AND PARTICIPANTS

Within the scope of this investigation, we will describe in detail the methodology used for the analysis of textual data, from a semi-structured interview conducted with a teacher of coded identification "E1", who has a two-year career in the Center for Professional Education (CEDUP) Vidal Ramos. The material from the transcription of this interview proved to be a textually rich corpus, providing an adequate substrate for a detailed thematic analysis.

The first stage consisted of defining codes and themes a priori, establishing them with direct anchoring to the specific objectives outlined by the generating research, as well as to the guiding question that permeates the study. The procedure adopted involved the careful reading and segmentation of the text into units of meaning, followed by the attribution of initial codes that captured the essence of the concepts and phenomena expressed in the interviewee's statements. This preliminary phase was decisive for the configuration of a comprehensive list of potential topics, which were registered and organized in the ATLAS.ti® software environment. The themes and codes were established in such a way as to directly reflect the dimensions and nuances of the phenomenon under study.

Concomitantly with the coding, the iterative revision of the codes and the redefinition of themes allowed a purification and analytical refinement, ensuring the alignment of the results with the theoretical and methodological guidelines recommended by the research. In this sense, ATLAS.ti® offered advanced resources for the manipulation and organization of data, including the possibility of creating code families, performing precise textual searches and establishing relationships between codes, facilitating the emergence of patterns and the construction of a solid and coherent analytical framework.

Through the use of the software, it was possible not only to categorize the data, but also to visualize connections between the themes, the elaboration of conceptual networks and the synthesis of the findings in a contextualized analytical model. The tool proved to be fundamental for the systematization of a process that excels in precision and analytical depth, enabling the emergence of interpretative deductions aligned with investigative purposes. This process resulted in the creation of a comprehensive list of potential themes, along with corresponding codes.

DATA ANALYSIS

For the analyses, each code was created with the aim of being flexible enough to capture a range of experiences and perspectives, allowing for a comprehensive and in-depth thematic analysis. The use of these codes, however, was only the first step in unveiling the layers of meaning present in the interviewee's narrative.

Next, we illustrate the use of the software in different stages of the analysis, demonstrating its functionalities in the application of real data. The functionalities explored in the use of the software in this phase of the research were the following:

ENCODING

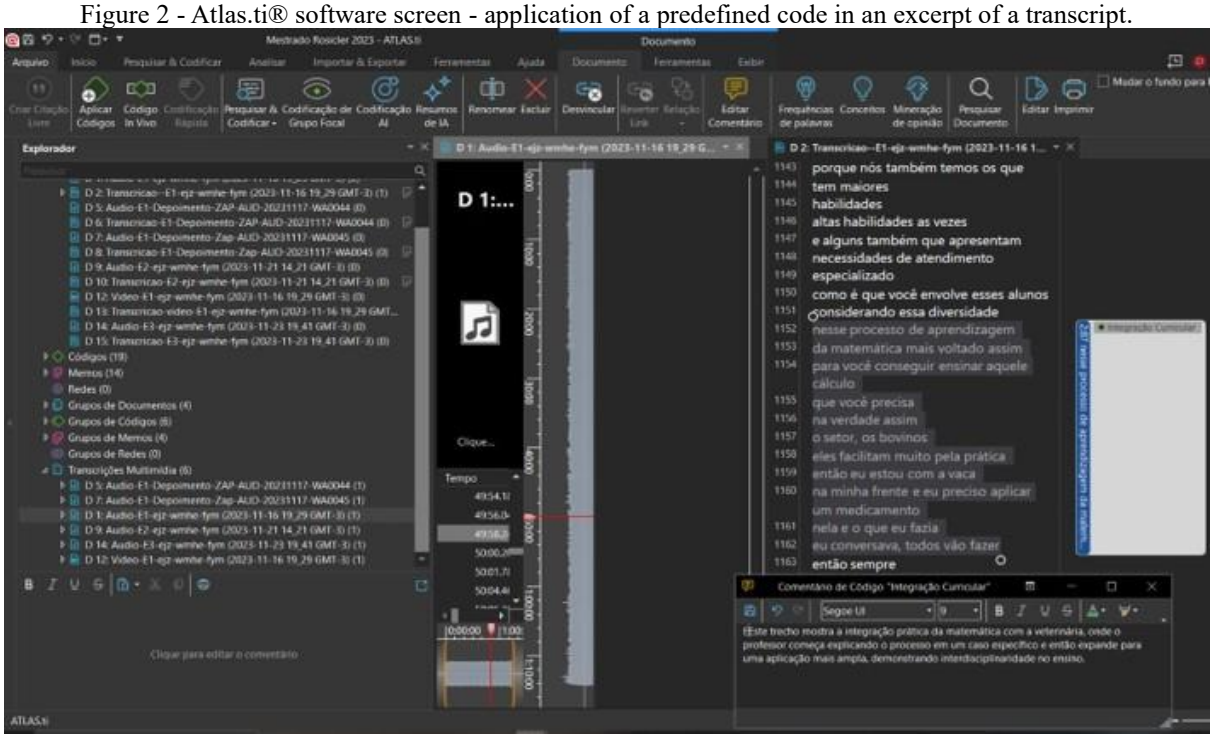
The initial coding, carried out from the application of the codes defined *a priori* already mentioned, has so far allowed the researcher to organize the data into significant units of analysis and connected to the research problem. The coding supported and organized by the software helps in identifying emerging patterns and concepts. For example, the frequent use of terms associated with "difficulty in mathematics" or phrases that refer to this code by context may reveal not only the teacher's perceptions of the challenges faced by students, but also point to the need for pedagogical changes or additional support in technical education. This identification supported by the tool is particularly useful in thematic analysis, as it provides clues to the formation of broader categories.

LINKING CODES TO A TRANSCRIPT SNIPPET

This functionality allowed a given part of the transcription to be interactively selected and encoded by applying it to one or more codes of the pre-defined list a *priori* stored in the software and to search for emerging themes, according to the thematic analysis methodology proposed by Braun and Clarke (2006). The goal is to refine these themes through iterative and reflective analysis, ensuring that the final themes are representative.

In figure 2, an excerpt of the transcribed text was selected by the researcher and a predefined code was applied. Automatically, the code is linked to the selected excerpt, making it easier to navigate through the codes later and later view the transcribed excerpts by themes.

Figure 2 - Atlas.ti® software screen - application of a predefined code in an excerpt of a transcript.



Source: Prepared by the author (11/2023).

The defined codes and emerging themes found using this tool were:

Interdisciplinary Practices in the Teaching of Mathematics:

There is evidence of significant potential to foster interdisciplinarity, which is supported by the practical application of mathematical concepts in agricultural activities, such as livestock management. However, the effective implementation of these concepts still faces significant challenges.

Contextualization of Mathematics in Everyday Life:

The connection between mathematics and the practical reality of agriculture is evident, for example, in the calculations of areas for pasture and dosage of medicines. These practices not only make it easier for students to retain content, but also reinforce the relevance of mathematical learning to their future professional lives.

Inclusive Education:

Inclusive strategies are being successfully implemented, adapting teaching methodologies to reach all learners. Positive feedback from parents and students has been noted, which suggests a growing recognition of the needs of inclusive education.

Pedagogical Impact of Teaching Practices:

The pedagogical practices adopted by the teachers seem to have a positive impact on the students' understanding, especially the application of mathematical concepts in real situations such as the rule of three and functions.

Teachers' Perceptions and Experiences:

Teachers are motivated by an approach that values active learning. They face challenges, but they also see significant opportunities for professional growth through the adoption of interdisciplinary practices.

Challenges and Opportunities:

The difficulty of aligning theory and practice is evident, and there is a clear need to improve teaching practices to better integrate mathematical concepts into practical reality, in addition to institutional support considered essential to promote continuous improvements.

WORD CLOUD

The word cloud represents a significant tool in identifying keyword frequencies in textual transcriptions. This method provides researchers with a quick and visual way to detect prevalent terms and language patterns, aiding in the qualitative interpretation of data with evident quantitative support. The use of this option in oral history research has analytical and interpretative value and complements traditional qualitative approaches with innovative technological resources. Portelli (2012) emphasizes the importance of not seeing oral and written sources as mutually exclusive, but as complementary, each with its own specific characteristics and functions that, when combined, enrich historical analysis. Thus, we can conclude that this technological aspect, as suggested by Portelli's (2012) reflection, expands the scope of textual analysis by providing a new layer of information that supports the researcher's interpretation.

In addition, as Portelli (2012) indicates, oral history focuses not only on events, but on the meanings attributed to them by individuals, which can be highlighted through the prevalence of specific terms in word clouds. This tool can reveal aspects of material culture and personal experiences that more traditional methods might not immediately capture, thus becoming a valuable resource in the methodological arsenal of oral history researchers.

The integration of these technologies does not replace the fundamental analytical skills of the researcher, but complements them effectively, allowing for a richer investigation of historical narratives, which by their nature, can be heterogeneous and eventually ambiguous. The use of both oral and digital sources fulfills a specific function that enriches historical analysis, thus supporting a deeper and more detailed understanding of the past.

In fact, in the research, the use of the word cloud allowed us to obtain a view of the predominant ideas of the interviews from the frequency with which certain words or expressions were repeated, establishing a relationship that also allowed us to create a view of the cultural aspects of the content of the interviews and to show the particular universe of each interviewee and the material analyzed as a whole. This universe is defined by a combination of expressions that refer to

a common thought. In the object of analysis, words such as "students", "teach", "people", etc. were identified.

Figure 3 - Atlas.ti® software screen - word cloud (verbs, nouns and adjectives).

Source: Prepared by the author (11/2023).

VERBAL DISCOURSE ANALYSIS AND ASSESSMENT FOR LINGUISTICS

Verbal discourse analysis and paralinguistic assessment occupy central roles in the study of oral history, standing out as fundamental for the deep understanding of the collected narratives. These methods of analysis help researchers interpret not only the explicit content of words, but also the implicit subtleties that convey additional meanings through nonverbal elements.

Verbal discourse analysis focuses on the explicit content and structure of the words used by the interviewees. As Alessandro Portelli suggests, oral sources reveal much about the meanings attributed to events by the narrators, which can be deeply personal and culturally rooted (Portelli, 2012). This analysis allows historians to access not only the facts narrated, but also the perceptions, beliefs, and emotions associated with those facts.

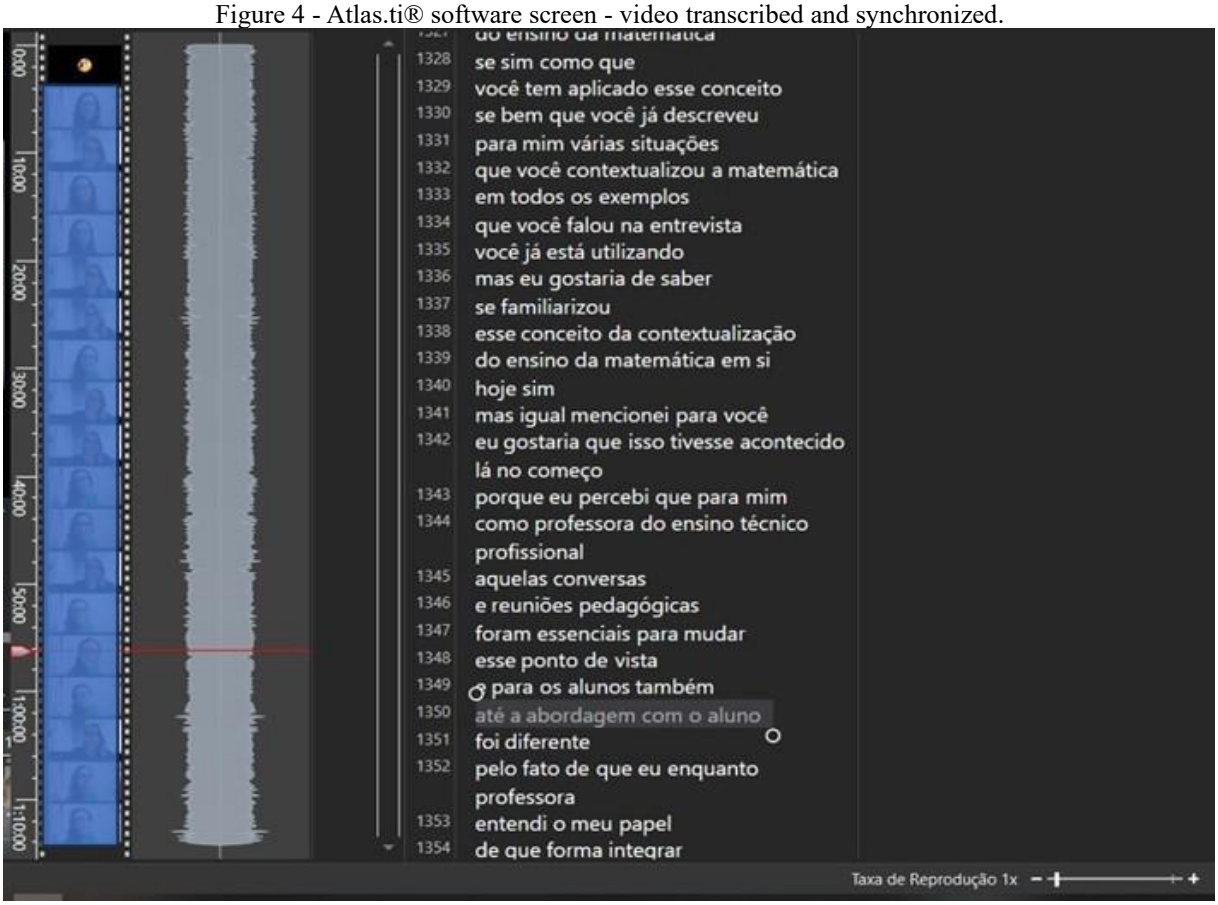
At the same time, paralinguistic assessment—which includes tone of voice, intonation, rhythm, pauses, and other vocal nuances—is crucial to capturing the "voice" of respondents more fully. Portelli (2012) emphasizes that paralinguistic nuances can indicate the narrator's attitudes and emotions, which are often not expressed directly through words, but rather through the way they are spoken. For example, hesitation, increased voice volume, or a change in speech rate may indicate a point of emotional stress, a particularly significant memory, or an attempt to emphasize the importance of an event.

These analysis techniques are essential for a thorough understanding of narratives in oral history, as they provide a richer and more detailed view that goes beyond the transcribed text. This is particularly important when we consider that oral history often seeks to give voice to marginalized groups whose histories may not otherwise be adequately documented.

As Portelli (2012) points out, by ignoring the paralinguistic aspects of interviews, one runs the risk of missing crucial information about how narrators perceive their own story. Therefore, these analyses not only enrich our understanding of historical events but also strengthen our ability to appreciate the diversity of human experiences and the complexity of personal memories.

This type of analysis was possible within the software. To facilitate this task, the software allowed the transcribed text to be synchronized with video excerpts of the interview, as shown in figure 4.

Figure 4 - Atlas.ti® software screen - video transcribed and synchronized.



Source: Prepared by the author (11/2023).

CREATION OF MEMOS

Essential to the process of thematic analysis (Braun; Clarke, 2006) is the use of memos and annotations, which play a crucial role in the organization, interpretation, and analytical deepening of data. These practices not only facilitate the documentation of initial ideas and reflections on possible codes and themes, but also increase the transparency and rigor of the analysis, allowing the

researcher to explore diverse interpretations, question their own assumptions, and critically reflect on how their perspectives influence the results of the analysis.

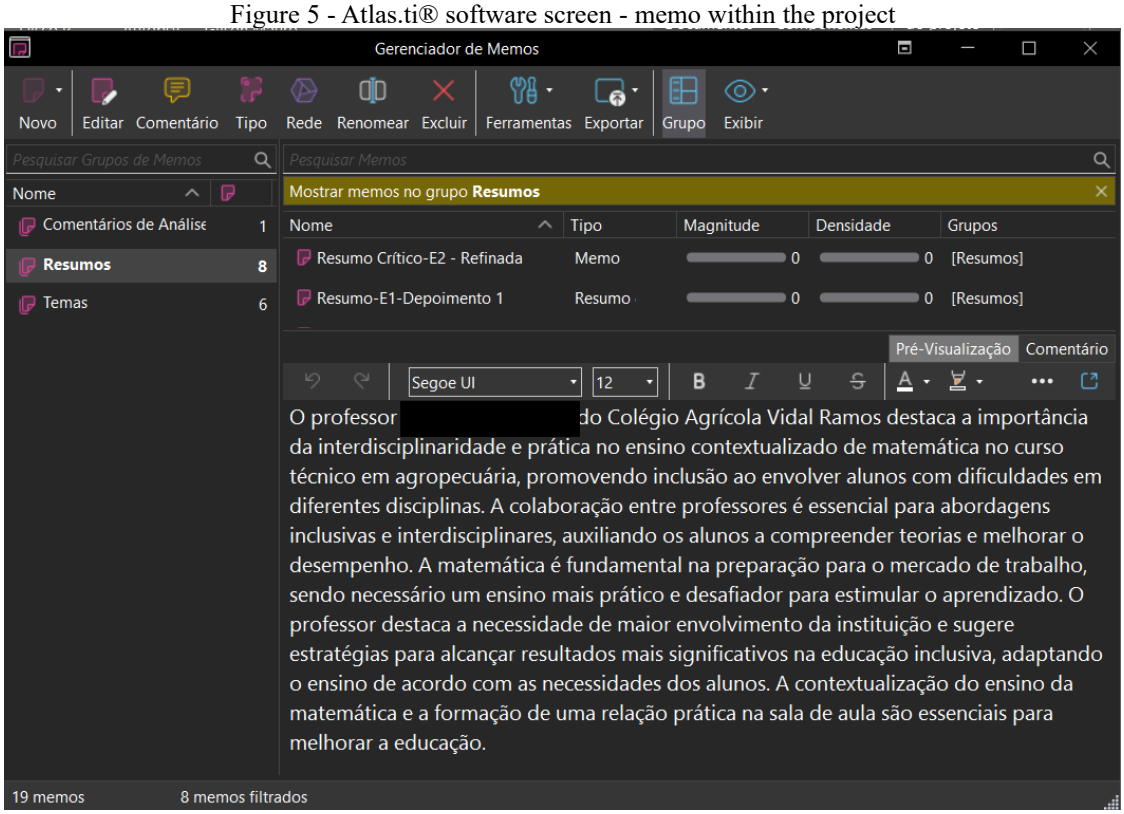
The functionality of memos and annotations extends beyond the mere organization of data, as they capture emerging insights and insights, refine understanding of the data, and document the analytical reasoning process, which is essential for the validity of the study. In addition, these records offer a solid basis for the discussion and justification of methodological decisions, both in academic publications and in thesis and dissertation defenses, contributing significantly to the methodological integrity of research.

The benefits of memos and annotations are palpable in the interpretive quality of the study. They promote deeper analysis by avoiding superficial approaches and encouraging deeper immersion into the data. Thus, these records are not just ancillary; They are integral to the analytical process, enriching the final narrative and ensuring that the analysis is both reflective and systematic.

In conclusion, the maintenance of memos and notes is indispensable in thematic analysis, supporting the structuring and methodological execution of qualitative research. They not only facilitate the organization of data, but also strengthen the rigor and transparency of research, which are central to the validity and reliability of analytical results, as highlighted by Braun and Clarke (2006).

The following figure shows a memo with a synthesis written by the researcher about the interview as a reference of the initial perception.

Figure 5 - Atlas.ti® software screen - memo within the project



Source: Prepared by the author (11/2023).

REVIEW OF PRE-DEFINED CODES AND THE CREATION OF IN VIVO CODES

In this aspect, the Atlas.ti software reveals a differentiated potential, especially through the functionality of *in vivo* codes. This feature allows you to capture expressions and terms directly from the interviewees, providing a contextualized anchor to the narratives. Braun and Clarke (2006) point out that thematic analysis is a flexible and detail-rich method that contributes significantly to the generation of an interpretative analysis of data. *In vivo* codes are essential not only to preserve the authenticity of the interviewee's voice, but also to explore nuances and complexities that could otherwise be lost in pre-defined or generalizing categorizations. Thus, these codes strengthen the qualitative analysis by providing a more in-depth view of the material analyzed, respecting the integrity and uniqueness of the discourses collected.

SETTING UP THEMES AND CONNECTION NETWORKS

This functionality of ATLAS.ti allows you to establish and visualize connections between different codes and thematic categories was instrumental in exploring the complexity and interconnectedness of qualitative data.

Using ATLAS.ti, it was possible to identify, analyze, and report patterns within the data in a way that not only captures the essence of respondents' experiences, but also reveals how different themes intertwine and influence each other. This ability to visualize complex relationships between topics facilitates the understanding of the dynamics underlying the perceptions and experiences reported, contributing to a more complete and contextualized analysis. The ATLAS.ti interface supported this process by providing tools that allowed an intuitive and visual manipulation of the codes, highlighting the interrelationship between them and highlighting how such connections can elucidate new patterns and deductions about the analyzed material. This tool was effective in building a more comprehensive and interconnected understanding of narratives, which was essential to deepen qualitative knowledge, generating meaningful and well-founded research results.

FORCE MAP

The establishment of the connection strength between the themes, another of the software's functionalities, was a critical step and the "force map" functionality of the Atlas.ti software was used, an essential tool that established and quantified the strength of the connections between the identified themes. This functionality made it possible to measure the relevance and frequency with which certain themes appeared in the interviewees' speeches. Such quantification was critical to prioritize the central themes and identify those that were secondary or peripheral to the experiences narrated. This directly interfered in the determination of the results of the research, as the clear visualization of the thematic relationships helped the researcher to understand how different aspects of the reports

interconnected and influenced each other. The ability to measure the intensity of the connections between themes not only made it easier to focus on the most influential aspects of the data, but also informed the research's interpretations and conclusions in a well-informed way.

DESCRIPTIVE ESSAY

Finally, the elaboration of the descriptive essay of results will consolidate the analyses in a document that should articulate the findings based on the first interview. This essay should present a synthesis of the main themes, demonstrate the relationships established between them, and interpret these findings in the light of the theories and the broader context of the study, seeking to answer the central question of the research (Minayo, 2010)

It is possible to affirm that the use of ATLAS.ti® in the technique of Oral History and Thematic Analysis offered, in this first evaluation, a solid structure to support the methodology for qualitative research.

It is necessary, however, to highlight, even if in a preliminary way, the learning curve, which requires training, dedication and a high level of technological familiarity, requiring, in addition, the availability of equipment capable of processing and storing data from different sources and in large volumes.

The amount of information and functionalities offered by the software allows the researcher to dive deeply into the data, maintaining a systematic and integrated approach, which honors the complexity of human narratives and the integrity of the interviewee's voice, in addition, keeping all documents organized and ready for consultation, reanalysis and eventual verifications.

It is noticeable that the quality and quantity of the software's analysis tools do not make the results easy or promote the quality of the research in an automatic way. The depth of the analysis, the quality of the results and the final product depend fundamentally on the researcher's performance and knowledge on the subject, from the adequate formation of the codes and themes, through the definition of their relationships within the context, to the process of synthesis and conclusion, with the software being a tool that allows in an outstanding way the amplification of these skills through the access to a significant number of automated ways to carry out the verification of the currents of thought and knowledge manifested by the interviewees.

Finally, due to the already mentioned technological dependence and arduous learning curve, it is recommended that the research with the use of this software be supported by a research assistant who can perform the training in the software and together with the researcher, and following his/her guidelines, set up the project and use the software, allowing the researcher to carry out the investigation without worrying about learning the software.

FINAL THOUGHTS

This article sought to explore the relevance and potential of the ATLAS.ti® software in the context of qualitative research, emphasizing its application in the oral history method and in the thematic analysis technique. Qualitative research, by focusing on the complexity of human and social phenomena, demands tools that allow a systematic and in-depth approach to the data collected. In this sense, ATLAS.ti® emerges as a robust resource, offering a set of functionalities that facilitate the organization, coding, analysis, and interpretation of qualitative data.

Throughout this study, it was possible to verify that the software not only optimizes the transcription and coding process, but also contributes significantly to the creation of a coherent and grounded analytical structure. The advanced functionalities of search and retrieval of information, as well as the data visualization tools, enable the researcher to explore the detailed and interactive exploration of the emerging themes and categories, enhancing the density and richness of the information collected.

The importance of the ATLAS.ti® tool for the preservation of data integrity and the voice of participants was emphasized, evidencing the software's commitment to the fidelity of the reports and the authenticity of the shared experiences. The ability to synchronize the transcripts with the original audio and video files is one of the distinguishing features of the program, which enriches the qualitative analysis by allowing the consideration of paralinguistic and non-verbal aspects essential for the full understanding of the narratives.

However, it is necessary to recognize that mastering ATLAS.ti® implies a learning curve that requires training, dedication and technological familiarity from the researcher. In addition, technological dependence and the need for high-capacity equipment for data processing and storage pose challenges that must be considered in the planning and execution of qualitative research.

In terms of results, the initial thematic analysis carried out in the transcription of the interview, through the software, reveals that the codes defined *a priori* were significant, as described below:

Interdisciplinary Practices in Mathematics Teaching: The curricular integration between mathematics and agricultural practices is underdeveloped, although it has the potential to enrich interdisciplinarity. The practical application of mathematical concepts in activities such as cattle handling makes it easier for students to understand, although there are challenges in effectively incorporating mathematics in such contexts.

Contextualization of Mathematics in Everyday Life and in the World of Work: Educational practices link mathematics with its practical applications in agriculture, such as calculations of areas for pasture and dosage of medicines. This approach not only helps with content retention, but also underlines the relevance of mathematics to professional practice.

Inclusive Education: Inclusion strategies are implemented to adapt teaching methodologies to all students, with reports of positive feedback from parents and students. These practices point to a growing recognition of the needs of inclusive education and the necessary adaptation of pedagogical methods.

Pedagogical Impact of Teaching Practices: Teaching practices are perceived as impactful for students' understanding, with practical examples such as the rule of three applied in real contexts. The need for practical assessment and guided feedback is highlighted, as is the continuous professional development of teachers to meet the challenges of more interdisciplinary and contextualised teaching.

Teachers' Perceptions and Experiences: Motivated by teaching that values "learning by doing," teachers face challenges and identify opportunities for growth by adopting interdisciplinary practices. Inclusive education emerges as a field for which many still feel unprepared.

Challenges and Opportunities: The difficulties in adapting reasoning and pedagogical practices to an inclusive educational environment are notable. There is a recognition that practical application often diverges from theory, suggesting a need for improvement in teaching practices. Institutional support is seen as essential to foster continuous improvement.

This set of themes found in the first interview analyzed, evidences the complexity and richness of mathematics teaching in an interdisciplinary and practical context, highlighting both the opportunities and the challenges faced by educators in the field.

The software allowed a refined and assertive understanding of the topics addressed, demonstrating feasibility as a means of enriching the investigative process. The integration between the technological tool and the methodology of Qualitative Research, Oral History and the techniques of Thematic Analysis enabled the production of scientific knowledge of excellent quality, with significant and consistent results and perceptions.

It is concluded, therefore, that ATLAS.ti® is a valuable and indispensable tool for modern qualitative research, capable of expanding the analytical capacities of the researcher and of promoting a study with high standards of quality and methodological rigor with remarkable use of the researcher's time and ability to centralize resources and document the research. It is recommended that researchers consider the possibility of having research assistants trained in the handling of the software, in order to maximize the potential of ATLAS.ti® without learning the tool becoming an obstacle to carrying out scientific research.

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