# Cognitive Interview Associated With Memory Box: Contributions to Narrative Research With the Use of Testimonies

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## Abstract

This article is the result of a research narrative, whose objective was to produce and present understandings about the creation and use of a device that associates cognitive interview (CI) and memory box to obtain testimonies. Two teachers from the Science Club of the Federal University of Pará in the Legal Amazon participated. The application of this device originates or a free testimony and a dialogue, which were transcribed and constituted the *corpus* of the research. For the analysis of the material, we adopted the software IRAMUTEQ associated with Discursive Textual Analysis (DTA). The *corpus* was processed, and, with DTA criteria, two categories emerged, through which it was possible to inventory the information contained in the testimonies and infer units of meanings that justify them. We conclude that the memory activator device considerably increases the volume and quality of information obtained as testimonies, contributing in a relevant way to narrative research.

*Keywords:* methodology, IRAMUTEQ associated with DTA, narrative research

# Entrevista Cognitiva Associada a Caixa de Memória: Contribuições Para a Pesquisa Narrativa com o Uso de Testemunhos

## Resumo

Este artigo é resultante de uma pesquisa narrativa, cujo objetivo foi produzir e apresentar compreensões a respeito da criação e uso de um dispositivo que associa a entrevista cognitiva (EC) e a caixa de memória para obtenção de testemunhos. Participaram dois professores egressos do Clube de Ciências da Universidade Federal do Pará na Amazônia Legal. A aplicação desse dispositivo originou um testemunho livre e um dialogado, que foram transcritos e constituíram o *corpus* da pesquisa. Para as análises do material, adotamos o *software* IRAMUTEQ associado à Análise Textual Discursiva (ATD). O *corpus* foi processado e, com critérios da ATD, emergiram duas categorias, por meio das quais foi possível inventariar as informações contidas nos testemunhos e inferir unidades de significados que as justificam. Concluímos que o dispositivo ativador de memória amplia consideravelmente o volume e a qualidade de informações obtidas como testemunhos, contribuindo de maneira relevante com a pesquisa narrativa.

*Palavras-chave:* metodologia, IRAMUTEQ associado a ATD, pesquisa narrativa

# Introduction

In this article, elements of the methodological procedures that are adopted in narrative research are presented through the testimonies of teachers who participated in activities which were developed at the Science Club of the Federal University of Pará (CCIUFPA) in the Legal Amazon.

It is common to use interviews in narrative research for the inventory of information about life histories and experiences that will constitute the research corpus, in addition to participant observation, among other field texts, which capture the subjectivity of the participants, favoring changes in reality or creating conditions for transforming the studied contexts (Clandinin & Connelly, 2015).

In this sense, the cognitive interview (CI) developed within the Psychology of Testimony — an area of knowledge that studies the processes involved in the construction of testimonies — has been establishing itself as an important tool for health care professionals and legal practitioners so they can obtain consistent information to fill their purposes (Ambrosio, 2015; Ministry of Justice, 2015; Geiselman & Fisher, 2014).

In education, when testimonies are used in order to build systematized information in qualitative research (narrative research), aiming to respond the issues raised in an authentic way, it is necessary to select procedures that avoid possible deviations, contaminations, extensions and omissions of information. Therefore, we asked the following question: in what terms does the cognitive interview, associated with the memory box as a device contributes as an inventory of information in narrative research based on testimonies of professors who graduated at CCIUFPA? In order to proceed with the investigation, we set out as a general objective to produce understandings regarding the use of a device created to obtain testimonies in narrative research and, as a specific objective, to schedule information from testimonies obtained about CCIUFPA's formative principles. As collaborators of this research, we selected, from a broader research, two former professors, with at least two years of experience in the activities of this space as a trainee professor and/or coordinator.

The presented text, which starts from this introduction, is organized in theoretical support and it is divided in three topics: the cognitive interview, the testifying task and the memory box; Results and discussion; final considerations and references. We discuss these aspects below.

# The Cognitive Interview (CI)

The CI is a method used in the legal field in order to obtain consistent and reliable information from witnesses involved in criminal suits (Geiselman & Fisher, 2014). These authors point out that CI is a systematic approach to interviewing witnesses in order to capture as much relevant information as possible without compromising the accuracy rate, that is, without influencing the assessment of the credibility of the testimony, which according to Machado (2014) can be done based on three approaches: physiological,

behavioral and content-centered. The CI was developed from studies whose results showed how much the interview protocols used by the American and British police, respectively, were insufficient for the collection of information from witnesses[1] (Fisher et al., 1987; George & Clifford, 1992). These results are justified by the following reasons:

> a) hide information; b) do not provide any unsolicited information; (c) give abbreviated answers and d) provide voluntary answers they are not sure about. Besides, they interrupt the natural process of searching through memory, making memory retrieval inefficient (Geiselman & Fisher, 2014, p. 2).

According to Geiselman and Fisher (2014), the difficulty came from the posture of the police interviewers, because when inquiring "they dominated the interaction with the witness, asking so many questions [...] which provoked short answers [...] that, often, discourage witnesses from assuming active roles" (p. 2).

From this perspective, CI has its scientific basis in memory and communication theory and, in legal cases, in law enforcement hearings. For the structuring and development of CI, the studies sought a basis in the literature of Cognitive Psychology in order to help identifying and recovering memories, which were organized into three basic processes: "memory and cognition, social dynamics and communication" (Geiselman & Fisher, 2014, p. 4).

We emphasize that witnessing is, above all, a complex and personal psychic experience, because the witness uses the sensory system to capture, store and express a fact. This is closely linked to our memory, which is responsible for the knowledge we have about ourselves, our past, other people and the world, in addition to being the basis of our expectations. It is the foundation of our future perspective and the goals to be achieved in our lives (Pergher & Stein, 2005, p. 3).

Izquierdo says (2011, p. 13) that memory means "acquisition, formation, conservation and recall of information, but it is also called learning". According to the author, we are what we remember and what makes us individual, but we are also what we forget, because memory is selective. In neurophysiology, memories are made by nerve cells (neurons), are stored in networks of neurons and are evoked by the same neural networks or by others and are modulated by emotions, the level of consciousness and moods. However, "the memory does not represent reality", it is rather a set of codes converted by the brain that also evokes it through codes (Izquierdo, 2011, p. 24).

In view of what was previously explained, we understand that CI aims to maximize the amount of resources for the recovery and recording of memories, exploring multiple routes and promoting better relationships and encouraging the witness, making the person an active figure in the process. All these facts justify the use of CI, both in legal and health cases, as well as in education research in favor of teacher training in which the use of interviews is common.

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1 People who see an event, typically a crime or accident, take place. Their statement about such an event is called a testimony.

Therefore, in the protocol that was developed there is a general structure for conducting an investigative interview with most people, but it should be used in a flexible way by the interviewers, as mentioned by Geiselman and Fisher (2014) below:

It is important to understand that interviewers must be flexible and must alter their approaches in order to meet the needs of each witness, rather than using a fixed model, forcing the witness to adapt to it. [...] It is more like a set of general guidelines or a collection of techniques than a recipe for how to conduct an interview. Each witness and situation will require a different approach (Geiselman & Fisher, 2014, pp. 4–5).

It is observed that the general protocol of a CI is developed in five interconnected sections (Figure 1) and the interviewer can conduct each one as he deems necessary to achieve his results.

**Figure 1**

*Sections of the Cognitive Interview (CI)*
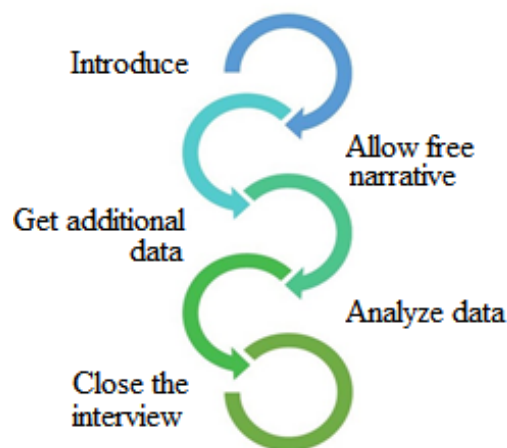


Source: adaptaded from Geiselman and Fisher (2014), by the authors.

Thus, in the concept of Geiselman and Fisher (2014), the first section is the introduction, where psychological moods are established which enable a harmonious relationship between the witness and the interviewer in which they can reduce anxieties and promote an "efficient memory recall and communication during the remainder of the interview" (p. 6). In this sense, the role of the interviewer is essential, and in order to achieve this objective should:

(a) develop rapport with the witness; (b) encourage the witness to play an active role through voluntary reporting; (c) convey investigative needs to obtain extensive and detailed information and (d) inform that a thorough memory search will require concentration (Geiselman & Fisher, 2014, p. 6).

In the second section, Geiselman and Fisher (2014) state that the interviewer provides the witness with an opportunity for an *uninterrupted narrative* of what happened. However, for this to occur, context reintegration is necessary, a process by which the witness retrieves information from memory. In addition, the authors point out that the interviewer must:

> give the witness enough time to recreate the period of time leading up to the target event, [...] mentally recreate the external factors (weather), emotional factors (mood, fear) and cognitive factors (thoughts) that were present at the time of the original event (Geiselman & Fisher, 2014, p. 8).

That avoids contaminations or additions to registered memory. After this phase, the interviewer requests the open narrative of the past event, which will allow the inference of the general representation of the witness and should write down follow-up questions that will be asked to the interviewee in the next section.

In the third section, aiming to *obtain additional information*, the interviewer develops efficient strategies to investigate the various memory registers, asking follow-up questions to dilate the richest sources of information provided by the witness in the previous phase, such as the details and recollections that lead to other facts. Questions should be open-ended enough, responses should not be interrupted by other questions, and the witness should be given the time necessary for memory recall and communication, with strategic pauses between responses (Geiselman & Fisher, 2014).

Non-verbal resources should also be encouraged at this stage, as some people are more spatial than verbal in their mental communications, therefore, they can respond with drawings, placing objects in certain places to illustrate abstract information. The interviewer can also ask different questions to access other memory routes for the same information. However, some forms of caution are mentioned in the following section.

> The interviewer should refrain from applying societal pressure on witnesses or otherwise encouraging them to answer questions they are unsure of. Likewise, interviewers should avoid inducing feelings of inadequacy by formulating questions in a negative tone (Geiselman & Fisher, 2014, p. 12).

The fourth section concerns the analysis of the generated information. This is when the data is reviewed, with feedback to the witness so that he can correct errors and omissions and even add extra information. The interviewer can also point out ambiguities and contradictions and ask for clarification (Geiselman & Fisher, 2014).

Finally, the fifth section is the closing of the interview, when the interviewer collects information about the witness, thanks the person for his collaboration, encourages contact in case of future memories, trying to extend the interview a few days later, if necessary. An important point in CI is the assessment that can be made by the interviewer (self-assessment) or by a supervisor, through audiovisual means, so that it is constantly improved (Geiselman & Fisher, 2014). Next, we highlight the concept of testimony, as a task of communicating and its relations with memory.

# The Task of Witnessing

According to the Latin etymology, testimony is a term derived from the word *testemonium*, that is, it is the statement made by a person who lived, witnessed or heard an event or phenomenon; this person is called a witness and the act of declaring what he has lived, seen or heard is called a testimony (Pierron, 2010).

Sarmento-Pantoja (2019) highlights that the testimony is presented in three types named: (i) *superstes* — the first to report — the one who lived the experience and testifies from the immersion in this experience and thus gives his testimony (the one who survived the fact/phenomenon that occurred); (ii) *testis* (the third subject) the one who saw — the eyewitness — who has the task of giving testimony as a spectator, that is, he sees and is seen. This form of testimony is close to what Benveniste calls the third person, the one who proposes to testify (Benveniste, 1976). And the third type is the *arbiter* (iii) who:

> Represents the figure of the witness who listens and judges, without having participated in that experience. In short, the judge is who will analyze the fact from the outside without direct involvement with the scene and therefore his presence is not noticed. In this sense, the *arbiter*, the referee, the judge, as a witness, knows the fact only thanks to the primary testimonies given by the person who sees or lives the fact (Sarmento-Pantoja, 2019, p. 13).

Pierron (2010) had already highlighted such meanings. In his opinion, the *arbiter* is "the voice of the one who, legally, is a witness without being a third person, the one who separates into two parts, due to a legal authority conferred on him […]. Etymologically, the word indicates the idea of seeing without being seen" (pp. 26–27).

As a practical example of the concepts of being a witness, let's imagine a football match (the event), in which there is a foul between two players (the dispute). Players are *superstes*, those who live the experience and report the fact firsthand (a football foul). The judge of the match is the *testis*, as he observes and is observed, he is a third party and an eyewitness and the video referees are the referee who are supported by the electronic refereeing support system known as VAR (Video Assistant Referee). VAR aims to help the central referee, on the field, to make decisions in situations considered doubtful (Amado, 2018). That is, the referee is the one who is not seen and is not a third party, but has the authority to judge the fact not only from what he hears, but also from what he sees.

Thus, in the scope of Testimony Psychology, in order to collect a testimony, first of all, it is necessary to happen a fact or phenomenon that is perceived by the witness. In this case, it is possible to say that not everything that occurs and in which a person is present is perceived by him. So what makes a person a witness? First of all, it is necessary that this someone is affected in some way by what happened.

Considering this, the narrative of a testimony depends on how the witness perceived, stored and retrieved the observed or lived fact. However, there are several factors that could influence the expression or quality of this testimony, as they are psychic elements that are constituents of a testimony related to neurocognitive science (Figure 2), so that it is necessary to explain them in order to understand the validity of a testimony, as there are variables that interfere in its construction and therefore in its expression (Ambrosio, 2015).

**Figure 2**

*Constituent Elements of Testimony*
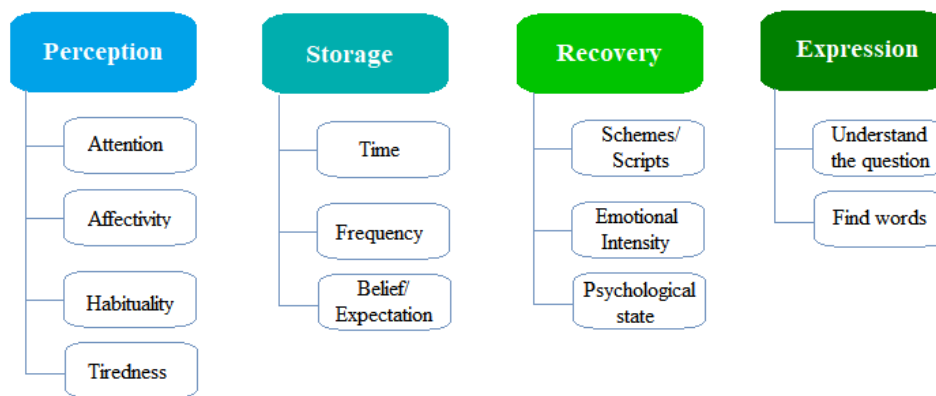


Source: adapted from Ambrosio (2015), by the authors.

Thus, according to Ambrosio (2015), the first element for creating a testimony is *perception*, which "is a process that consists of giving meaning to the information received, experienced or lived, captured by the sensory system, which reached the cerebral cortex" (p. 396). However, many factors could influence perception, such as attention, affectivity, habituality and tiredness.

Regarding *storage*, which is influenced by organic conditions, it is a complex process that is influenced by factors such as beliefs, types of lived experiences and patterns that can lead to distorted or incomplete evocations of facts. Retrieval is a process that depends on the intensity with which the information was stored and evoked, as well as the psychological state of the witness. Thus, the expression or communication of the testimony is conditioned to all these processes and depends on fragmented memories, among other factors, such as the environment and the language used by the interviewer (Ambrosio, 2015). Memory triggers (photographs or objects in the context) can be useful in the process of evoking memories. In the sequence, we make explanations about the memory box.

## The Memory Box

Human beings keep many objects that carry sentimental, memorial and identity value which are representative of coexistence and experiences, and can also tell who we are, how we lived in certain periods, among other things. Who has never heard of families that keep their children's clothes, toys, objects that belonged to grandpa or great-grandfather, or photo albums? Currently, almost everyone likes to record a moment, a person, a place, among other things.

Within this perspective, the presence of such objects is discussed, such as artifacts that have a strong memorial and identity meaning in the lives of teachers, which is when they use what we call a memory box as a support. Nery et al. (2015, pp. 43–44) when analyzing films, in which the characters were invited and provoked to evoke memories from the given device, memory box is defined as "drawers, boxes, albums and diaries that keep photographs, letters , tickets, among other objects, that have some representation for the people who keep them but not necessarily being their property", even so they are important to them.

Thus, the relationship between objects and memory lies in the fact that they emit and receive information that "communicate memories, identities, forgotten facts and places of individuals in the world" (p. 44). It is understood that the objects that make up a memory box can be of different types. Some bring marks of family histories that, passed down from generation to generation, present characteristics and particularities that materialize over time, thus becoming biographical, symbolic and representative of identities belonging to that family.

Furthermore, both objects and photographs are memory-evoking supports that bear marks produced by the sensory senses that materialize and update the moment and history. Photography, as a manifestation of memory, multiplies and democratizes it, allowing the cultural reading of a generation (Le Goff, 1990).

About inventorying memories of teachers is perhaps not an easy task. Let's imagine the amount of objects, photographs and other things they keep throughout their formative and professional journeys, it's a vast universe of life stories and meanings. Therefore, taking an inventory means promoting an archaeological search, searching trunks and remembering different moments lived. With that in mind, we created a methodological procedure to inventory information in the testimonies of CCIUFPA graduates, which we highlight in the following section.

## Methodological Paths

In this investigation, narrative research is assumed as one that takes place in a three-dimensional space, based on Dewey's thought of experience, expressed in terms such as: personal and social (interaction), past, present and future (continuity), combined with the notion of place (situation), according to Clandinin and Connelly (2015).

Therefore, in the initial movement of reflection of the research, an attempt is made to understand what it meant for the collaborator what he lived in that context, what senses and meanings he can express, when referring to the lived experiences. We did not want to contaminate, cause enlargements and/or omissions in the testimonies of the collaborators, since the testimony is haunted by the false and counter-testimony translated by the impartiality in its construction (Pierron, 2010). So how is it possible to get information about experiences using testimonials?

Clandinin and Connelly (2015) say that narrative researchers work with responsive communities, so that when people share memories with others, they ask to be helped to see other meanings that can lead to other retellings, is that people collaborate to build the world they are in, but they need to remake themselves and offer research understandings that can build a better world.

However, in the opinion of the aforementioned authors, in narrative research "it is impossible as a researcher to remain silent or present a perfect, idealized, investigative, moralizing self" (p. 98). Thus, they invite us as researchers to be on the alert when writing a narrative, since we are subject to the narcissism and solipsism that haunt us, building simplistic and unconditional narrative trajectories, composed of static scenarios and one-dimensional characters. In this way, what matters is, within the stories told, to recognize the stories not told, seeking "[...] to balance the softness contained in the plot with what is obscured due to this smoothness [...] and to look through our multiple selves" (pp. 233–234), one of them being the critic one.

In order to avoid the risk, which Clandinin and Connelly (2015) speak of, in order to obtain information for the purpose of building the research corpus, we thought of a device that would help us to uncover possible mistakes in testimonies and/or flagrant mismatches in the cadence of a story told, which could, in the course of the research, fall into distrust or discredit.

Therefore, after collecting data about instruments used in narrative research and other types of qualitative research, we decided to use the cognitive interview associated with the memory box, as a device for obtaining testimonies, which we called the Memory Activator Device (MAD).

Aiming at assembling the memory box, we selected artifacts that were related to each other and that were representative of experiences resulting from our formative processes lived in or from the CCIUFPA and, thus, functioned as a memory activator for the witnesses to share their stories of life and training in that place with the possibility of expanding information to say beyond what it says, to explain modulations and/or bifurcations in the speeches about remembered experiences.

The mentioned CCIUFPA was founded in 1979, expanded, creating several others in the State of Pará, and continues in full activity, disseminating as a culture a formative model for the improvement of science and mathematics teaching in the Brazilian Amazon. The theoretical and methodological bases that sustain the training activities are anchored in early assisted practice and in partnership, governed by a set of

training principles such as: teaching with research, protagonism in learning, democratic environment and learning by manufacturing, among other things (Gonçalves, 2000). Many undergraduates and Basic Education students have been/are immersed in such training processes over the years. Justifying our joining, in a way, with CCIUFPA and the choice of representative activities and, consequently, of artifacts that constituted the created memory box.

The artifacts (Figure 3) were handcrafted and based on scientific concepts of an interdisciplinary nature, according to those used in our training experiences during the degree and professional practice.

**Figure 3**

*Memory Box Artifacts*



Source: authors' collection.

The artifacts in the memory box were accompanied by narrative texts or texts of activities carried out in practical activities both at CCIUFPA and in basic and higher education, such as: a notebook made of recycled material with seed paper; a ring game for developing logical reasoning; a scientific accordion — didactic-pedagogical support for communicating experiment results; the semaphore game — playful tool for teaching students. Finally, a time capsule and parchment - experience as a representation of space and time. Given the above, in Figure 4, we present the Memory Activator Device (MAD) created to be used in this research.

**Figure 4**

*Memory Activator Device (MAD)*

| Sections | Memory Activator Device |
|---|---|
| | Phase I |
| Introduction (Section I) | Creation of a memory box with objects that represent experiences carried out based on CCIUFPA's formative principles to develop a good relationship with the witness. |
| | The objects in the box act as activators of the witness's memory with the aim of inviting the person to share their formative experiences in an active and voluntary way. |
| | Letter and explanatory audiovisual resource which serve to enunciate the objectives of the investigation and what is expected of the witness containing the description of his attributions. |
| | Clarify that the witness's effort is essential for the purpose of the research and make it clear that he will have adequate time to carry out his duties. |
| Uninterrupted Narration (Section II) | Aiming at recreating the lived context, the elements (artifacts): the box, the notebook, the seed paper, the ring game, the scientific accordion, the traffic light game, the time capsule, the parchment and the flash drive serve as activators from memory. |
| | A witness is invited to freely write or record the testimony and share objects that represent their training during the period they participated in CCIUFPA activities. The interviewer/researcher should take notes and follow-up questions discreetly. |
| Obtaining Additional Information (Section III) | Phase II |
| | After the collaborators return the memory box, analyze the material and prepare strategies for a dialogue with the witness about the material. |
| Analyze Information (Section IV) | Dialogue with the witness; remember what you shared; ask you to retract or add other information; point out ambiguities/ contradictions and request clarification. |
| Closure (Section V) | Request information about the witness; thank the person for his collaboration and leave open the possibility of other meetings. |
| Assessment (Section VI) | Evaluation of the procedure by all participants. Self-evaluation. Evaluation of an external collaborator and feedback from witnesses). |

Source: created by the authors.

According to the sections presented in the MAD, we organized this procedure in two phases: in the first one, we developed the first three sections (I, II and III) that generated the free testimony (TL) and in the second phase, the other sections (IV, V, VI) that generated the dialogued testimony (DT). With regard to the planning and application of the device, it is observed that in section I, it refers to the construction of the box and its assembly. We started with the selection of training activities and the

reconstruction of artifacts that represented the actions developed at CCIUFPA, followed by their planning and selection of materials (already presented earlier) and later sending them to the witnesses so that, when sharing our memories, they could feel free to narrate their own experiences at CCIUFPA (section II).

We emphasize that two professors who had graduated from CCIUFPA participated in this investigation as collaborators (witnesses), who were selected based on the following criteria: they should have at least two years of participation in the activities in this place as a trainee professor and/or coordinator. The two witnesses, after signing the Informed Consent Form (ICF), received the memory box and had enough time to comply with section II of the MAD. The witnesses were aware of what their attributions would be. Thus, they sent videos, one with approximately 40 minutes and the other with 1 hour and 20 minutes of recording with their respective free testimonies, in addition, one of the participants created and sent his own box with some artifacts.

After the boxes were returned, in section III, we *analyzed* the material received and *planned* section IV, which was the *dialogue* with the witnesses about the material shared by them. These took place one in person and the other via the Google Meet platform. They were recorded in audio/video with approximately 2 hours each.

The theme was elaborated from the material returned by them, without a pre-established script, but we made notes and records to clarify doubts and also to seek and incorporate other information necessary for the research. Thus, in an open way, we were inquiring about the witness's impressions regarding the memory box material and his formative experiences. They, in turn, seemed excited and demonstrated that they were comfortable contributing, they answered and added other information, they also asked about our shared experiences and commented on how, when handling the memory box, they were impacted by the memories of their experiences at CCIUFPA.

 And the closure (section V) was made in these meetings in which we were grateful and left the door open for possible return and future dialogues. We emphasize that in the MAD we added the evaluation as section VI, which was done through dialogues and feedback among the researchers, the witnesses and a teacher who volunteered to accompany the entire application of the device.

After the phases of the MAD had been concluded, the recorded testimonies were transcribed and constituted the corpus of the research in which the analyzes focused on the criteria of the Discursive Textual Analysis (DTA), whose essential elements are organized in the following topics: unitarization, which consists of dismantling texts to achieve units of meaning; categorization, which concerns the construction of relationships to form more complex sets. Both processes require the researcher to impregnate the analysis material, triggering the emergence of new understandings and the construction of metatexts, in which the new understandings are made explicit with the combination of constructed elements, making it clear that these processes occur in the dynamics of the research (Moraes & Galiazzi, 2020).

We also highlight that we used the IRAMUTEQ software (Camargo & Justo, 2021; Salviati, 2017) to process the transcribed material from the two MAD phases that made up the textual corpus and thus streamline the analysis process with DTA. IRAMUTEQ is a free digital tool which is based on the R software and the python language; it does lexical analysis of textual corpora and presents them in statistical results. Therefore, it is possible to perform five types of data processing: Factorial Analysis by Correspondence (FAC) — Identifies and formats text units, transforming text into text segments (splits the text every three lines); Descending Hierarchical Classification (DHC) — the text segments are classified according to their respective vocabularies and the set of them is distributed according to the frequencies of the forms; Similitude Analysis — based on graph theory, identifies the co-occurrences between words, the connection between them, common parts and specificities according to variables and word cloud — graphically groups words according to frequencies (Camargo & Justo, 2021; Salviati, 2017).

Among the mentioned possibilities, we chose the similarity analysis to process the transcribed testimonies of both witnesses, since the results presented in graphs with colored communities of occurrences and co-occurrences of interconnected words make it possible to identify the structure of the analyzed textual corpus. In the processing of the research corpus, the material was coded and organized in a single text file, without punctuation, accentuation, aligned to the left and saved in a text note (UTF-8), as required by the application of IRAMUTEQ. The results of processing in the tool and analysis with DTA, as well as the profiles of the two witnesses, identified with fictitious names (Edith and Bento) for the preservation of their identities and according to the ethical precepts of research, are described below.

## Results and Discussion

In this investigation, the objective is to study the CI protocol and adapt it from a memory box to create, develop and test an adapted CI protocol, which we call Memory Activating Device (MAD) with a focus on obtaining of testimonies in narrative research, in the field of teaching and training of science teachers. To do so, we had the collaboration of two professors who had graduated from CCIUFPA — Professor Edith and Professor Bento, who gave us testimonies about the formative processes experienced during the period they spent there.

Professor Edith is a graduate, master and doctor in Science and Mathematics Education. At CCIUFPA, she was a trainee professor throughout her graduation and in her master's degree, she was a guiding professor for a group of trainee professors, who collaborated with her in her master's research. In the first two levels of training, her research deals with topics related to the CCIUFPA in which she participated and during her doctorate she dealt with two other science clubs from the interior that had their origins in the first one, all located in the legal Amazon.

In the first phase of MAD, Edith received the memory box expressing her curiosity and willingness to collaborate with the research. She returned the box two weeks later, accompanied by her own memory box with artifacts selected from her experiences: *the science teaching book by investigation* (Schiel & Orlandi, 2009) — the first one she used at CCIUFPA; the *logbook* and an *atlas about plants* (Plantas, 1996) — used with her collaborators in the master's degree; *the science book for children* (Williams et al., 2003) and a flash drive with photographs and videos of classes that marked her personal and professional path since she entered the CCIUFPA.

In addition, a few days after the box was returned, teacher Edith sent a video testimony with approximately 40 minutes of recording. In the following phase, the dialogued testimony was recorded, lasting approximately 2 hours. The recordings of both the free testimony (FT) and the dialogued testimony (DT) were transcribed in order to compose the field text of the research.

Professor Bento has a degree in Chemistry and a PhD in Science Teaching. He was a trainee professor, coordinator and collaborator of the CCIUFPA. Since the moment he was invited to the research he was enthusiastic and when he received the box he was happy to participate, returning it two weeks later with the following materials: a 1h20min *video*; a *slideshow* with photographs, in which he narrates his training at CCIUFPA and his professional career; a *letter* addressed to the researchers and a *book chapter* of her authorship addressed to teachers who teach science and mathematics. This material was transcribed, originating the free testimony (FT) of Bento. In the next phase, the dialogued testimony (DT) of approximately 2 hours was recorded, which was also transcribed.

Both testimonies (FT+DT) by Edith and Bento constituted the textual corpus of the research; they were organized and coded in a single file to be processed in the IRAMUTEQ software, whose results generated the general information (Figure 5) that we highlight below.

**Figure 5**

*General information*

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+-+-+-+-+-+-+-+-+
|I|R|A|M|U|T|E|Q| - Tue Oct 18 2022          16:41:01
+-+-+-+-+-+-+-+-+
Number of texts: 4
Number of text segments: 926
Number of forms: 3575
Number of occurrences: 3572
Number of slogans: 2353
Number of active forms: 2183
Number of forms supplementary: 162
Number of active forms with frequency >= 3: 942
Average of forms per segments: 40.992441
Number of clusters: 3
761 segments classified on 926 (82,18%)
#########################
time: 0h 1m 35s
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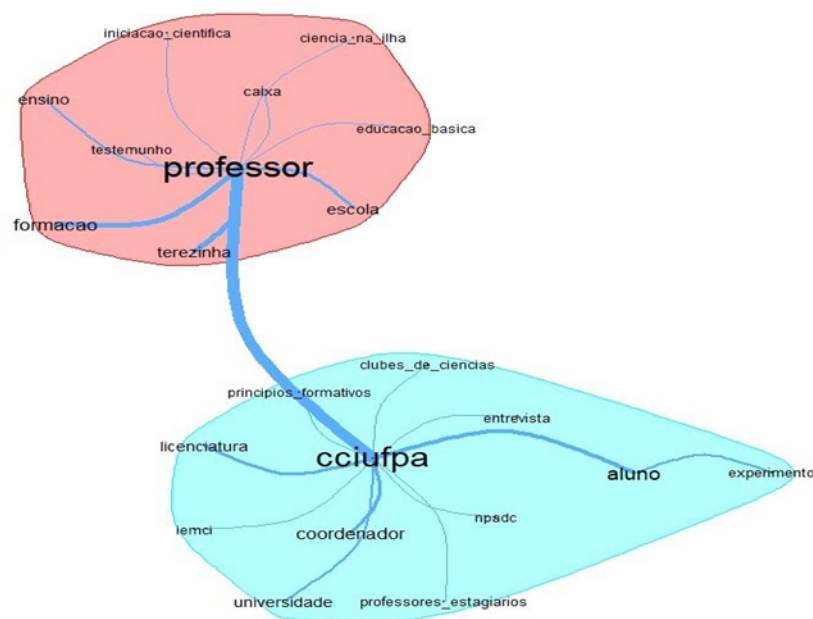Source: IRAMUTEQ software processing.

Then, based on the generated data, four texts were processed, which are the testimonies of the collaborators (2FT+2DT), divided into 926 text segments (STs), with 3572 forms, 37959 occurrences, 2353 slogans, 2183 active forms (words considered in calculations like nouns, verbs, common nouns and unrecognized words), 162 supplementary forms (additional words like prepositions, adjectives, etc.); it also presents the number of active forms with a frequency greater than or equal to 3, the average of forms per segment, the number of classes (3) and the percentage of use of text segments of 82.18%. All processing took 1minute and 35 seconds.

Another type of processing that we chose was the similarity analysis that allowed us to select words from a menu of forms (default for the Portuguese language) according to their hierarchical frequency scores, as well as set, adjust and select the graphopt format and the type tree (maximum), among other existing possibilities, such as size, color of branching and communities (colorful sets that group words with greater relationship).

According to the resulting similarity graphopt, two colored communities (pink and turquoise) were formed, represented by the words "teacher" and "CCIUFPA", since they have a greater occurrence and greater connection strength among themselves and within their communities, according to the co-occurrences, respectively (Figure 6). In the set of STs created in the processing that form the corpus, these terms are colored in red when evoked in the dictionary of words in the tool, from which it was possible to create an inventory of information in the testimonies and, according to the ramifications, identify the emergence of categories related to DTA.

**Figure 6**

*Graph that resulted from the Similitude Analysis*



Source: IRAMUTEQ software processing.
*Note.* The similarity graph is in Portuguese to maintain the originality of the image provided by the processing.

We emphasize that the investigated object is formed by the testimonies of the teachers who provided data about their formative processes at CCIUFPA, thus building understandings about the use of MAD and obtaining these testimonies and inventory of the information contained in them. Therefore, colored communities were formed with the following words/forms and their occurrences:

- Pink community: teacher (409), training (102), school (90), Terezinha (66), teaching (40), box (27), witness (18), basic education (14), scientific research (14), science on island (13).
- Turquoise community: CCIUFPA (377), student (146), coordinator (82), graduation (59), university (49), experiment (33), interview (30), intern teachers (23), nucleus (18), institute (17), science clubs (10), formative principles (9).

Thus, the systematization of STs was carried out from the perspective of DTA through the inventory of information with the objective of creating units of meanings that justified the emergence of categories (Figure 7).

**Figure 7**

*Systematization of Text Segments (STs) with DTA*



Source: created by the authors

Continuing, in this article, according to the occurrences and co-occurrences presented in the similarity graph, we consider excerpts from the inventory of information found in the STs and the respective senses/meanings attributed to them. These are identified as follows: Witness name + Text segment (ST) + location number in the textual *corpus*, for example: Bento ST1.

Next, we present the emergence of two categories: i) Teacher training and scientific research for basic education and ii) CCIUFPA and the formative principles for science teaching, although they do not eliminate the possibilities of other emergences of categories and, therefore, another amount of information about the professor and the CCIUFPA.

## Teacher Training and Scientific Initiation for Basic Education

Being a teacher is, above all, being a professional and, in the search for professionalization, training is a key element, since, in order to be able to teach, you need teaching knowledge or professional knowledge (Tardif, 2014), which are built during initial training and throughout the profession in self-training processes and opportunities for continuing training, based on a broad and varied education.

With that in mind, in the following excerpts, the first information inventoried from Bento and Edith's testimonies relate to aspects of scientific initiation, such as organizing and building material for classes and aspects of initial training and internship at undergraduate level and at the CCIUFPA to develop the autonomy of teaching.

> *In Chemistry, there were practical laboratory classes and I did an internship in six months of observation, the teacher did not let us have autonomy and where I actually learned how to teach was at CCIUFPA (Bento, ST 37, 69).*

> *I worried a lot about not giving a boring class. I felt responsible for making the most perfect class in the world and I had no material for anything, but I built some, because I wanted the students to have that, so when I wanted to get it right, I made a lot of mistakes (Edith, ST 89, 2021).*

We note that Bento makes connections with the internship in the chemistry laboratory and with the internship at CCIUFPA. He explains that the internship in the chemistry laboratory had practical classes, but at CCIUFPA the classes are also practical, so what's the difference? When analyzing his testimony, we infer that at CCIUFPA a practice is developed based on a democratic environment (Gonçalves, 2000), where the intern actively participates in activities from planning, execution, evaluation and even reflection on the practice, while in the supervised internship the theory and practice are dissociated.

Pimenta (2019), when referring to the theme, mentions a reset that is related to what the CCIUFPA develops. Among the emergencies, he considers as possibilities:

> Internships carried out with/as research; internships in the collaborative approximation between the higher education institution and the schools in the teaching networks; internships taking the praxis that takes place in schools as a starting and ending point for teacher training, the construction of professional identity and teaching professionalism (Pimenta, 2019, p. 21).

Edith demonstrates an understanding of the type of lesson to plan and develops her own material. She was focused and had the initiative to produce whatever was needed for the class, demonstrating how the development of autonomy is recurrent at CCIUFPA, characterized by personal involvement and protagonism in learning (Magno & Gonçalves, 2021). Therefore, we infer that this is the unit of meaning that the data represents in the testimony of both: *the relationships between the types of internships and the type of classes to be planned and executed.*

A second excerpt from the inventory made from the testimonies of Bento and Edith, indicates information about the theoretical contribution of science teaching at the time reported by them in the following excerpts.

> *I remember that I had read many Frota-Pessoa books, those manuals they send from UNESCO about experiences. I read Hennig, because it was a book that I saw in teacher training courses that were held at the Institute/Núcleo (Bento, ST 46–47).*

*The book Science Teaching by Investigation was the first one I had read when I joined the CCIUFPA. It was suggested by my scholarship coordinator and who was part of the CCIUFPA as a collaborator. The suggestion of the study was to understand the types of activities that are/were developed in space (Edith, ST 477–478).*

Teacher training for science teaching developed at CCIUFPA is endorsed by collaborating professors in an explicit way, focusing on teaching by investigation with socially significant themes. Since the creation project, teacher Terezinha (the founder) was based on authors who sought changes in the way of learning and teaching science and this was provided in the form of a pedagogical laboratory in which the intern learned and practiced teaching in a real context, with basic education students, aiming for both to form critical, creative citizens who are socially committed to the environment in which they live (Gonçalves, 2000). Therefore, as a unit of meaning, teacher training at CCIUFPA is solidly based on experienced theorists in this area.

Bento and Edith continue to address this issue in the following excerpt, also demonstrating that studies and reading are needed to assume the identity of the CCIUFPA.

*We knew that it was necessary to produce stimulating classes for the students to enjoy [...] so this is a challenge to our creativity, making us really look for the best teacher we can be. This really provokes us to gain experience, read about things, discuss with our colleagues, learn from them, seek tips from more experienced teachers (Bento, ST 61, 66).*

*One student raised the question: why does the grasshopper jump if it can fly? We thought we'd teach them about grasshopper habitat and anatomy. The guidance counselor said, but do you understand the grasshopper jump? I felt that I couldn't be a teacher. How to teach children what elastic force is? It was very complex, we had to study a lot and we started to invent a methodology to teach (Edith, ST 91–94).*

The characteristic of training at the CCIUFPA, as Bento said, causes the intern to recognize his incompleteness, which leads him to seek to learn more and more and to practice teaching without fear of making mistakes, according to the concepts learned in readings, sharing, guidance, etc. with the objective of becoming a good teacher, that is, a good teacher needs to be reflective, creative, seek experiences, do readings, discuss with colleagues and more experienced teachers and share experiences and also create methodologies to teach subjects in an interdisciplinary way. Therefore, the unit of meaning found is *to become a good teacher.*

In this direction, Nóvoa (1992) defines five aspects for the constitution of a good teacher: (i) Knowledge — the teacher builds teaching practices that lead students to learning; (ii) Professional culture — this means knowing and engaging with the school and the profession, learning from other more experienced teachers; (iii) Pedagogical tact — Knowing how to guide knowledge, considering the personal dimensions (personality); (iv) Teamwork — teaching professionalism implies collective and collaborative work

that builds communities of practice and pedagogical movements beyond administrative organizations; (v) Social commitment — teaching practice is based on principles, values, social inclusion and cultural diversity, breaking through imposed boundaries (pp. 30–31).

The inventory also presented information regarding the professional development of the two professors, who report situations that marked them and the reverberation of what they experienced in their professions and attribute the recognition of this to the CCIUFPA.

> *I loved staying during these 10 years at CCIUFPA, I have learned a lot: administrative issues, I have met people, wrote two books on science methodology while being CCIUFPA coordinator, I have got my doctor's degree in Europe, so it was a fantastic period. A lot of learning and a lot of personal and professional growth (Bento, ST 135).*

> *I am very grateful to the CCIUFPA and now that I am in my doctorate doing research on other clubs that were originated from it. The experience has helped me to be critical in relation to several aspects. I adopted as purpose of life to contribute in some way to the idea of the CCIUFPA, I want people to know and value the work of this place (ST 162–167).*

We observed that both obtained the doctor's degree and also recognize that the CCIUFPA has a great share in this personal achievement, as they both highlight the professional development that they had in this training space. Bento became an effective member of the university, he was coordinator and is currently a collaborator of the CCIUFPA and Edith, graduated during the period of this investigation, has plans to contribute to CCIUFPA by reactivating or creating a training center to continue the work and support those which originated in the process of expanding.

We emphasize that these statements by collaborators consolidate what Pimenta (2019) mentions about training "with a view to the future insertion of critical-reflective teaching professionals and proponents of perspectives of transformative and emancipatory action, as collective subjects in the school environment" (p. 21). Therefore, as a unit of meaning, teacher training at CCIUFPA provides professional development.

In view of this recognition, the teachers highlight the work of the founding teacher and promoter of a differentiated, collaborative and humanized teacher training.

> *The teacher Terezinha brought people from the museum to train at the center, since that time she was concerned with the courses, because she wanted to multiply training at CCIUFPA. When the contract with the museum ended, they opened the "Clube do Pesquisador-Mirim" [at the Museum] (Bento, ST 370–372).*

> *When the CCIUFPA was created, the person in charge of everything was teacher Terezinha and because of her leadership there was an expansion. These professors from the countryside also had this perspective of creating a club with the training principles of the CCIUFPA (Edith, ST 54–55).*

The information highlighted in the testimony of Bento and Edith denote that since the creation of the CCIUFPA, teacher Terezinha thought of a teacher training that was expanded and not closed in a club where only those who participated would benefit. Thus, the activities expanded not only within the city, but in a good part of the territory of the Legal Amazon, with characteristics that would later become formative principles. Thus, as a unit of meaning, we emphasize that *the development and expansion of the training principles of the CCIUFPA depend on the work of the coordination team that is in charge of the activities.*

In this way, through the inventoried information, we made explicit the units of meanings that justified the emergence of this category. Below we present the clippings with the inventory of the second category.

## The CCIUFPA and the Formative Principles for Science Teaching

The CCIUFPA has formed, since its creation and with its own characteristics, groups of university students for the teaching of science in basic education, which over four decades has contributed to the improvement of science teaching. Bento and Edith were subjects of this training. In the excerpts of their testimonies, they mention aspects of the beginning of their experiences in that place.

*A young man who was a chemistry student and was at the academic center told me: — Bento, I work at CCIUFPA. Go there, man. I think it's better for someone with a degree. Look for the CCIUFPA which is a very nice place to work, and you will like it (Bento, ST 41).*

*I did experiments just for the sake of experiments when I joined. We said "teach me" and they said you have to do an experiment to develop with the CCIUFPA students every Saturday, because the class has to be investigative, teaching science here is like that (Edith, ST 85, 141–142).*

The information present in the excerpt from Bento's testimony indicates how he got to know the CCIUFPA and started his activities, while in the excerpt from Edith's testimony she indicates the first impressions of her activities at the CCIUFPA. We can infer that the unit of meaning concerns the *entry process and beginning of their activities as trainee teachers* at CCIUFPA.

Edith, when referring to the beginning of her activities at the CCIUFPA, demonstrates that she did experiments for the sake of experimenting, however, she is oriented to do research-based teaching, which, for Sasseron (2018), has the following characteristics "the active role of students; learning beyond conceptual content; teaching through the presentation of new cultures; the construction of relationships between everyday practices and practices for teaching; learning for social change" (p. 1067).

In addition, in the following excerpts, it is possible to see how they report everyday facts at CCIUFPA and that they did not even realize how much it enabled them.

> *In the process of separating materials, I prepared the classes, we discussed about the classes during the week, what we were going to do on Saturday and I separated the material and I had to have these boxes to put and transport this material to Saturday classes. There was a dispute between the interns for the boxes. When I was a coordinator I bought more boxes (Bento ST 54–55).*

> *The CCIUFPA coordinator makes all the difference, I remember the time when I was an intern, we were at our meeting planning classes, he came in to find out what was going on and gave ideas and participated in the meetings because there was no tutor to monitor the classes (from interns), but he accompanied (Edith, ST 77–79).*

We observed that the separation of materials mentioned by Bento, as well as the quote about the planning meeting made by Edith, are formative situations at the CCIUFPA that all trainee teachers experience, and are related to their attributions both as a trainee professor and as coordinator. In this perspective, Rosito and Lima (2020, p. 59) highlight "the planning and evaluation of the practices developed, the challenge of coordinating, the work of groups, teamwork and the possibilities that arise from this are among the gains" of these attributions.

This theme is common in other passages in the testimony of both, leading them to currently reflect on how important this process is, as mentioned by Bento: *it is in this process that you learn in practice all the stages of a good class* (ST 58) and by Edith: *it is a process of deconstruction* (ST 71). Thus, we can infer from this information that the units of meaning are related to the attributions of the trainee professor and the CCIUFPA coordinator.

In this sense, according to Bento, in order to keep students in CCIUFPA activities, it was necessary for interns to take dynamic classes, because *if they are boring classes, we lose students, they stay in CCIUFPA classes because they like the classes* (ST 59–60). Edith, on the other hand, when accompanying interns at CCIUFPA in their master's research, mentions that to teach at CCIUFPA, interns need to know the training principles so that students could *use this knowledge to be an active citizen of society* (Edith, ST 112). Such principles are personal involvement, protagonism in learning, democratic environment and learning by doing (Magno & Gonçalves, 2021).

Therefore, it is noticeable that the teachers developed the principles of the CCIUFPA and became aware of them some time later, Bento already as coordinator and Edith on her return to the CCIUFPA on the occasion of the master's research in which she accompanied the CCIUFPA interns. The unit of meaning noted is that the CCIUFPA has a set of specific principles to form that reverberate in professional development, which is the unit of meaning that is presented from the information presented. Bento mentions that: I ended up using the know-how I gained at CCIUFPA at school (ST 76), as Edith points out in an excerpt of her testimony that she has plans to reactivate the academic leadership groups created in the expansion of CCIUFPA to the countryside at that time.

Another point to be emphasized in the information provided in the testimonies concerns the scientific dissemination events organized by the CCIUFPA. Bento mentions the X Science Fair and another event that was *Science on the Island* created during the period in which he was coordinator based on the need to respond to questions from riverside communities regarding the results of research carried out by the university in that region.

> *It is also worth telling a little about the history of a CCIUFPA scientific dissemination event. In 2005, the CCIUFPA began to receive riverside students, parents would bring the students by boat, drop them off in the morning and pick them up between 11:00 and 11:30 am (Bento, ST 155–156).*

Edith and Bento talked about their published productions, such as, for example, two books published on science teaching methodologies by Bento and Edith commented on articles published in events and journals, among other works. Thus, based on the information presented, the unit of meaning is that *the CCIUFPA promotes scientific dissemination beyond the university space*.

Scientific dissemination is a field of knowledge that, through action strategies, "enlarges the possible dialogues between science and society. Just like the process of producing scientific knowledge, scientific dissemination is also permeated by economic, technological, social and political interests" (Fundação Oswaldo Cruz, 2021, p. 8). Thus, as in the first category, it was possible to justify this category based on the information inventoried in the testimonies of Bento and Edith.

## Final Considerations

The purpose of this research was to produce understandings regarding the creation and use of the cognitive interview associated with the memory box as a memory activating device (MAD) to obtain testimonies in narrative research.

In order to achieve this goal, a device was designed and its use with the collaborators was carried out in two phases: in the first, a memory box was built with artifacts that were created and used in activities developed by us in basic/higher education based on the formative principles of a CCIUFPA, to work as a memory activator for collaborating professors, so that they could share their experiences in this space without our interference.

The second phase was developed after the memory box was returned along with the teachers' free testimony. The guidelines for this phase were followed, which resulted in a second testimony created in a dialogue between the teachers individually and the researchers, making it possible to complement information and acquire other data as important as those collected during the first phase.

We came to the conclusion that this device was decisive for the quantity and, mainly, the quality of the information obtained about the CCIUFPA, as the teachers felt free to give their testimony with confidence and coherence and we, as researchers, were

able to inventory the information contained in the testimonies, as vast as our interest and objective in this research. Such information, even if it does not end the possibilities, was enough for us to find the units of meanings and justify the emergence of the two categories presented and thus create arguments to answer the research question.

In the first one — *Teacher training and scientific initiation for basic education* — the units of meaning were: relationships between the types of internships and the type of classes to be planned and executed; teacher training at CCIUFPA is solid, based on experienced theorists in this area; becoming a good teacher; teacher training at CCIUFPA promotes professional development; the development and expansion of the training principles of the CCIUFPA depends on the way of coordinating.

In the second one — *CCIUFPA and the formative principles for teaching science*, the units of meaning identified were: entry process and beginning of their activities as trainee teachers at CCIUFPA; the attributions of the trainee professor and the CCIUFPA coordinator; the CCIUFPA has a set of specific principles to train that reverberate in professional development; scientific dissemination.

We also understand that in the use of the MAD, which was applied in two phases, there is the benefit of the active participation of the collaborator in interaction with the researcher in the construction of the testimony, which allows the identification and inventory of information, since in the first phase the researcher, by sharing experiences it allows the collaborator to evoke experiences and select those that he considers important to share and in the second phase, in free dialogue, both, researcher and collaborator, not only recall and reflect on the experiences, but jointly update and re-signify them in a bidirectional training process. We conclude, according to the terms presented, that the Memory Activating Device (MAD) created from the cognitive interview, associated with the memory box, contributes significantly as an inventory of information in narrative research with the use of testimony.

## Acknowledgments

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**Disclosure statement**

No potential conflict of interest was reported by the authors.

**Compliance with Ethical Standards**

The authors declare this study was conducted following ethical principles.