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BARDIN'S METHOD OF CONTENT ANALYSIS IN EDUCATIONAL RESEARCH IN SCIENCE, TECHNOLOGY AND SOCIETY

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ABSTRACT

This article presents, briefly, how the content analysis published by Bardin (1977) was organized, in order to exemplify the important steps of this method, which was applied in the research of the master's dissertation of the Graduate Program in Science and Technology Teaching. The present study was developed with the objective of exemplifying the use of content analysis as a data analysis methodology for beginner researchers. The study contributed to the construction of knowledge, offering an uncomplicated way to perform data analysis in research involving science education. It is expected to demonstrate some of the paths described by the author in her work Content Analysis, so that the reader who is starting to use this proposal can understand the phases, as well as use it in their research.

Keywords: Content analysis. Methodology. CTS.

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INTRODUCTION

THIS ARTICLE PRESENTS CONTENT ANALYSIS AS A METHOD

This study was based on the master's thesis of the Graduate Program in Science and Technology Teaching – PPGECT entitled: Continuing education in early childhood education with a STS focus: discussions about the field of experiences "spaces, times, quantities, relations and transformations" of the BNCC, which was structured from the content analysis of Bardin (1977). It was decided to apply thematic categorical content analysis as one of the forms of data treatment.

Content analysis, an instrument of interpretative analysis, has been gaining notoriety in the field of science teaching, widely applied by researchers in the area of science and technology education, to analyze the data collected in their studies, using the qualitative approach of an interpretative nature, as well as the quantitative approach.

In search of information to unravel the research problem, the data collection technique was carried out through: observations, notes in a field diary, photos, videos, as well as structured interviews, carried out through *Google Meet* with the research participants.

Lima (2013) describes content analysis as a tool that helps to understand the discourses that social actors externalize, the well-founded technique allows to classify the collected material minimizing it, allowing the elaboration of categories and a consistent analysis. Thus understanding the true meaning of the speeches.

However, it is common for the researcher to have some difficulty in describing and organizing the data, because the theory of the method is often totally detached methodologically from the research analysis process. Consequently, content analysis opens up possibilities to serve as an instrument serving different guiding problems in different educational areas.

Thus, in this article, in order to exemplify, it is briefly presented how the content analysis was organized based on Bardin's (1977) assumptions.

The interest in content analysis in the dissertation was permeated by the need to attribute meaning to the discourses established during the research, an action that aimed at discoveries and studies, in search of an answer to the guiding problem of the research. The present study was developed with the objective of exemplifying the use of content analysis as a data analysis methodology for beginner researchers.

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SOME THEORETICAL ASPECTS OF LAURENCE BARDIN'S CONTENT ANALYSIS

According to Bardin (1977), content analysis as a method becomes a set of instruments for discourse analysis, which uses organized procedures and can be applied in any form of communication, that is, in any nature or support. During the analysis, the researcher will try to understand the meaning of the communication, the characteristics, structures or reference that are hidden, making them considerable. Seeking the critical unveiling in Bardin's words. Conceptualizing content analysis as:

> A set of techniques for the analysis of communications aimed at obtaining, through systematic and objective procedures for describing the content of messages, indicators (quantitative or not) that allow the inference of knowledge related to the conditions of production/reception (inferred variables) of these messages (BARDIN 1977, p. 42).

From this reflection, it can be said that content analysis, as a methodological instrument, allows us to conclude knowledge related to the research carried out. In addition, this technique provides means of analysis to act on different data sources, which change over time, such as interviews, speeches, letters, e-mails, texts, media materials, among others.

> Content analysis is a technique for analyzing communications, which will analyze what was said in the interviews or observed by the researcher. In the analysis of the material, it is sought to classify them into themes or categories that help in the understanding of what is behind the discourses. The path taken by content analysis, over the years, goes through several data sources, such as: newspaper news, political speeches, letters, advertisements, official reports, interviews, videos, films, photographs, magazines, autobiographical reports, among others. (SILVA; FOSSÁ, 2015, p. 3).

It also analyzes the discourse and the discourse, so the researcher must be prepared during the analysis to understand, unveil the hidden narratives from the analysis phases, trying to understand what was said and "listen" to what was not said.

Still, according to the author:

> Therefore, all initiatives that, based on a set of partial but complementary techniques, consist of the explanation and systematization of the content of the messages and the expression of this content, with the contribution of indices that can be quantified or not, based on a set of techniques, which, although partial, they are complementary (BARDIN, 1977, p. 42).

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To carry out content analysis, Bardin (1977) presents three poles of analysis: 1) pre-analysis; 2) the exploitation of material; 3) treatment of the results: inference and interpretation.

DESCRIPTION OF THE CONTENT ANALYSIS METHOD

The choice of the theme developed in the process of elaboration of the master's dissertation arose from the need to raise critical and judicious discussions about the influence of science and technology in the formation of the citizen, observing in the pedagogical practice which we also place, there is a lack of training and even coherent practices in Early Childhood Education involving the teaching of science.

The pedagogical approaches at this stage of basic education sometimes only take place in activities involving commemorative dates such as: environment day, water day, tree day, beginning of spring, and some other themes, in a traditional and uncritical way.

There is a scarcity of studies involving the teaching of science in Early Childhood Education, which highlights the work with the fifth field of experiences of the National Common Curricular Base (BNCC), that is, scientific knowledge, 'spaces, times, quantities, relations and transformations'. And to enter the children's universe, the professional needs to consolidate teaching practices based on the fields of experiences, bringing discussions, experiences, projects, forming students aware of the social implications of science and technology in the world in which it is inserted.

Quadros (2022), signals that the construction of knowledge happens through the awareness of knowledge, from reflection, discussion and action on it, when the teacher participates in training moments with a STS focus, well planned, he will be able to consolidate teaching and learning processes.

To compose the study, readings were made on science, technology and society (STS), scientific and technological literacy (ACT), BNCC, Science teaching in basic education, highlighting leading authors who study the area, namely, FOCHI (2020), BAZZO (2010), OLIVEIRA (2018), AULER AND DELIZOICOV (2006), (AULER, 2011), CHRISPINO (2017). (SILVEIRA; BAZZO, 2006, p. 80) LORENZETTI (2000) CHASSOT (2003).

Knowing that today, society is bombarded by the products produced from TC, "It is important and desirable, and even essential, that the general public has more and better information about Science and Technology". (LORENZETTI, 2000, p. 33).

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To bring the participants closer to the aforementioned topics, involving the correlation between science and technology and society, a training process was established in the middle of the Covid 19 pandemic in 2020.

The STS approach, inserted in this process of continuing education, contributed to the construction of the social, cultural, scientific and technological knowledge of the participants The training process took place 80% online and 20% in person, through the *Google Meet* and *WhatsApp platform,* the recording took place through the easy voice recorder, from *Digipom* for mobile phones version 2.8.3, and only the participants' speeches were recorded during the interviews, which took place individually, in the other activities notes were made in the field diary. The sample of participants was 14 teachers and 20 students.

With the difficulty of physical contact, small gatherings being prohibited due to the high risk of contamination of the subjects by COVID 19, we sought a clearer and more consistent way to collect and analyze the data collected in the course of the research.

Thus, when starting the preparation of the training project, the question arose as to how to analyze the data collected online? How to carry out a reliable process of analysis in order to answer the guiding question: What is the contribution of continuing education with a STS focus for Early Childhood Education teachers with discussions about the field of experiences 'spaces, times, quantities, relations and transformations', of the BNCC, for the pedagogical practice of educators of a CMEI, aiming to promote ACT?

From this we read several master's and doctoral dissertations of the Graduate Program in Science and Technology Teaching (PPGECT), which cited the content analysis described by Bardin (1977), from this we went after the theories and practices related to this analysis methodology, we had access to the book by Lauren Bardin, and several articles, among these: OLIVEIRA (2008), CALVACANTE (2014), CAMPOS (2004), DOS SANTOS (2012), MENDES (2017), Lima (2013), Silva and FOSSÁ (2015).

The content analysis of the interviews and field diary notes followed three poles of analysis: 1) pre-analysis; 2) the exploitation of material; 3) treatment of the results: inference and interpretation. At first there were more mistakes than successes, due to some erroneous interpretations of the theory, for a better understanding we organized a step by step, following the guidelines of Bardin's book (1977) from pages 99 to 149, which we were complying with and marking each completed step.

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1st Pole of analysis Pre-analysis

- Floating reading of the transcribed interviews and notes made in a field diary;
- Choice of subjects;
- Formulation of the objectives and the hypothesis
- Preparation of indicators;

2nd Pole of analysis and exploration of materials

- Listen several times to the oral records of the interviews and meetings that were transcribed,
- More thorough reading of the materials by marking the text identifying the participants.
- Clippings, groupings and enumeration
- Highlight record unit and context unit.

3rd Pole of analysis treatment of results: inference and interpretation

- Interpretation based on the proposed objective;
- Interpretation in search of answers to the guiding question
- Develop categories;
- Have meaningful and reliable results.

The content analysis of the master's dissertation was carried out starting with structured interviews, photos of the activities, 1 four-minute video, notes in a field diary from observation, starting with continuing education, preparation of the work project, lesson plans and application of the lesson plan, thus being able to use textual and visual data.

Lima (2013) cites other data sources, which can also use the content analysis described by Bardin, the documentary being through letters, newspaper articles, minutes, historical documents, pronouncements by politicians, laws, even observation carried out by one or more researchers, we also include *e-mail*, text and voice messages and video carried out by the application, WhatsApp, Google Meet which was also part of our analysis process.

Carlomagno and Da Rocha (2016) corroborate this issue, describing other forms of content analysis, electoral campaigns, discourses adopted by candidates for political office, websites of political parties, from what has been described we indicate that the method of content analysis has different applicabilities.

After the transcription of the interviews and notes in a field diary of the training process based on the participants' speeches and reflections, as well as the responses to

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the provocations made by the researchers and interpretations of gestures and attitudes of the participants.

Contact was then established with the documents to be analyzed, making the initial reading, that is, floating reading, feeling the initial impressions of the participants, choosing the documents, using the process of exclusion and inclusion at this time, determining which documents would be useful to answer the guiding question of the dissertation.

The reading was long, due to the fact that we are living in a moment of global pandemic, we ended up having plenty of time available to choose the documents to be submitted to the first part of the analysis, enabling the constitution of a *corpus* of the analysis. The constitution of the *corpus* in the selection required the choice of the fundamental rules described by Bardin: rule of homogeneity, rule of representativeness, rule of exhaustiveness, rule of pertinence.

The analysis obeyed the rule of exhaustiveness which, not leaving out any element considered important for research, we did not adhere, representativeness, because we chose to analyze complete material without sampling, the research took place during the pandemic the material was not extensive, due to the difficulty of interlocutions through the social platform.

Regarding the rule of homogeneity, the retained material underwent precise criteria. With regard to the rule of pertinence, it was found that the selected material, the interviews and the notes in field diaries, photos and videos, were adequate to respond to the problem of the research.

During the analysis, indexes were referenced and indicators were elaborated, the initial moment of interpretation of the collected material, observing repeated indexes, words or speech interruptions. In this circumstance, the recordings were listened to several times, which initially resulted in the transcription of 80 pages.

Starting from the choice of materials, a hypothesis can be raised based on the elaborated objective: to analyze the contribution of a continuing education with a STS focus to work with the students of Education of experiences "spaces, times, quantities, relations and transformations", proposed by the BNCC, for the pedagogical practice of the teachers of a CMEI in the city of Ponta Grossa - PR, from a project aimed at promoting the ACT.

The initial hypothesis raised was supported by the assumption that by establishing a training process that puts on the agenda possibilities of building knowledge that promotes activities and reflections with the Science, Technology and Society (STS) focus, it is

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possible to promote an effective understanding of teachers, more articulated with the demands of society.

Concluding this first phase, Bardin points out that if this first phase is carried out, a thorough work "... The various operations of the pre-examination have been properly completed, the analysis phase itself is nothing more than the systematic administration of the decisions taken. (BARDIN, 2011, p. 101). By completing this step consistently, we move on to exploration of the selected material in a more substantial way.

2nd Pole of analysis the exploration of material:

The appearance of the term science, technology and society (CTS), BNCC, curriculum, science teaching was observed, which was demarcated in the material with the color green. We had initially separated a large number of documents, including the drawing and the answers of the children participating in the study, during the application of the lesson plan, but in the following readings it was decided to use only the material referring to the discourses of the participating teachers, which were defined as sufficient.

The appearance of the terms science, technology and society (STS), BNCC, curriculum, science teaching was observed, which was demarcated in the material with the color green.

For the exploration of the documents, they were numbered and classified with the nomenclature from P01 to P14, representing the participating teachers and highlighted in red non-relevant questions and in blue relevant questions.

After the initial organization, the exploration of the material already separated and parts already demarcated began, in a more attentive and meaningful way using the colors green, red, blue, starting the coding of the data:

> It corresponds to a transformation - carried out according to precise rules - of the raw data of the text, a transformation that, by cutting, aggregation and enumeration, allows a representation of the content, or its expression, capable of enlightening the analyst about the characteristics of the text, which can serve as indices (BARDIN, 1977, p. 103).

During the rereading of the highlighted and enumerated material, we highlight our registration units (UR) once again the words science, technology and society (CTS), BNCC, curriculum, science teaching, and also, fields of experience, curriculum, which were the themes that we suppose were closest to the objective and were contemplated several times by the research participants.

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The units of records (RU) can be paragraphs, words, themes, and depend on the data collected, which help to answer the problematization of the research and achieve the objectives raised, in our research we marked in green words were repeated several times, observing in which context unit (CU) this appeared in the discourse highlighted in paragraphs.

With the frequency of the words themes, we started to read and interpret the context of these both in the interview and in the field diary, attributing meaning to the understanding and doubts of the participants, we also made it clear that some of the questions asked in the interviews were not answered due to the lack of knowledge of the theme. As is the example in relation to the term STS, three participants said they were unaware of the term.

After choosing the units, we made cuts, demarcated, enumerated and classified, and, finally, we formulated the initial categories that were taken from the context units, that is, from the paragraphs to which the registration units were marked. Remembering that content cannot be classified into more than one category. CARLOMAGNO AND DA ROCHA (2016).

3rd Pole of analysis treatment of results: inference and interpretation

In this phase we seek to involve the critical analysis of the results obtained and the interpretations, seeking to give meaning and validity to the raw results. To infer, according to Bardin (1977), is to extract a consequence, to articulate one message to others. Therefore, the communication that one of the participants manifested needs to be interrelated with other messages from other participants, observing different perspectives, meanings or positions.

Thus, the registration units organized from the excerpts in the transcripts of the interviews and the notes made in the field diary, which initially were words, themes, were identified in paragraphs, giving rise to the first categories. The paragraphs were grouped into sentences according to the topics addressed CTS, ACT, BNCC, CT, field of experiences and science teaching, based on the composite *corpus*, that is, structured interview, training and practical activity demonstrated from the photos and video, being composed in the logbook, gave rise to the intermediate categories, and these the final categories, which was arranged in sentences that establish connections with the elements of data analysis/treatment of the results obtained and the interpretations within the dissertation.

Still on the categories:

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> The categories can be created after the rereading of the selected documents, with the initial categories arising from the first interpretation of the documents that, after reading and observation, will give rise to the intermediate categories and finally the final ones
> which groups the ideas of the previous category, but with the most effective interpretation of the documents analyzed (BARDIN, 1977, p. 107).

Based on the above, the content analysis sought to ascertain: 1) the interviews conducted to know the previous conceptions of the teachers about the themes to be addressed; 2) the conversations during the meetings in the continuing education group based on the themes BNCC and its fields of experiences, STS, ACT, work with STS in education; 3) contributions of a continuing education program for teachers in the construction of STS practices from the elaboration of the work project, as well as the lesson plans; 4) the application of lesson plans to students.

Table 01 - final categories

	Composition of the Corpus	Final categories
01	Structured interview	Previous knowledge of the teachers from an interview on the themes: Science and scientist, technology, CTS, ACT, BNCC, work with Natural Sciences in Early Childhood Education from the fifth field of experiences of the BNCC.
02	Continuing education, photos, video.	Continuing education in the locus of teaching action: CTS, BNCC and their Fields of Experiences, Scientific and Technological Literacy, Science Teaching in Early Childhood Education from the fifth field of experiences of the BNCC
03	Hands-on activity	Production of the work project and lesson plans from QSCT.
04	Hands-on activity	Application of the lesson plans by the research participants

Source: The author.

The final categories raised served as a title for the discussions based on theorists who study the themes addressed. From the categorization, it became simpler to answer the guiding question of the dissertation, looking only at what was really essential for research, in order to achieve the objectives set for the study. The entire analysis process took place manually, without the use of *software*.

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METHODOLOGICAL PATHS

This article aims to present, in a summarized way, how the content analysis published by Bardin (1977) was organized, in order to exemplify the important steps of this method, The technical procedure was the participant research, with the participation of the subjects to be researched in the natural environment, in which the researcher participates and approaches the researched object. In search of information to unravel the problem of this research, the data collection technique was carried out through: observations, notes in a field diary, photos, videos, as well as structured interviews, carried out through *Google Meet* with the research participants.

For data analysis, the content analysis methodology, described by Laurence Bardin (1977), was used as a parameter. According to Silva and Fossá (2015), content analysis examines communications, through interviews and from the researcher's point of view, helping to interpret what is behind the participants' speeches. The stages for conducting the research, according to Bardin (2011), need to be organized in three phases: 1) pre-analysis; 2) exploitation of the material; and 3) treatment of results, inference and interpretation. The analysis was based on the diagnosis through the interview; teacher training; preparation and application of the work project and lesson plans.

FINAL CONSIDERATIONS

It is expected that, with this discussion, we will have presented some aspects of the Content Analysis described by Laurence Bardin (1977) as a methodological assumption, contributing with reflections on the methodology that is highlighted in academic research.

In view of the difficulties encountered due to the Covid 19 pandemic, IN 2020 AND 2021, the year of the process of investigation and data analysis of the master's thesis, the approximation and study, with content analysis, brought a "breather" to this researcher, who intended to produce reliable and consistent scientific knowledge, which left researchers in related areas with rich material with potential for future research.

This presentation did not propose to demonstrate the content analysis based on Bardin in detail, but to present some of the paths described by the author in her work, so that the reader who is starting to use this proposal can understand the phases, as well as make use of it in their research. Content analysis as a methodology for data analysis in qualitative research involving science, technology and society, demonstrates its importance

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in the face of data analysis and simple forwarding, with consistent results as long as it is carried out in a committed way.

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REFERENCES

1. Auler, D. (2011). Novos caminhos para a educação CTS: Ampliando a participação. In W. L. P. dos Santos & D. Auler (Orgs.), CTS e educação científica: Desafios, tendências e resultados de pesquisas (pp. 73–98). Universidade de Brasília.

2. Auler, D., & Delizoicov, D. (2006). Ciência-Tecnologia-Sociedade: Relações estabelecidas por professores de ciências. Revista Electrónica de Enseñanza de las Ciencias, 5(2), 337–355.

3. Bardin, L. (1977). Análise de conteúdo. Edições 70.

4. Bardin, L. (2011). Análise de conteúdo. Edições 70.

5. Bazzo, W. A. (2010). Ciência, tecnologia e sociedade: E o contexto da educação tecnológica (2ª ed. rev. e atual.). Editora da UFSC.

6. Brasil, Ministério da Educação, Conselho Nacional de Educação. (2018). Base Nacional Comum Curricular. Secretaria da Educação Básica, União Nacional dos Dirigentes da Educação.

7. Campos, C. J. G. (2004). Método de análise de conteúdo: Ferramenta para a análise de dados qualitativos no campo da saúde. Revista Brasileira de Enfermagem, 57, 611–614. https://www.scielo.br/j/reben/a/wBbjs9fZBDrM3c3x4bDd3rc/

8. Chassot, A. (2003). Alfabetização científica: Uma possibilidade para a inclusão social. Revista Brasileira de Educação, (22), 89–100.

9. Carlomagno, M. C., & Da Rocha, L. C. (2016). Como criar e classificar categorias para fazer análise de conteúdo: Uma questão metodológica. Revista Eletrônica de Ciência Política, 7(1). https://revistas.ufpr.br/politica/article/view/45771

10. Cavalcante, R. B., Calixto, P., & Pinheiro, M. M. K. (2014). Análise de conteúdo: Considerações gerais, relações com a pergunta de pesquisa, possibilidades e limitações do método. Informação & Sociedade: Estudos, 24(1), 13–18. https://www.researchgate.net/profile/Ricaro-Cavalcante/publication/329399124

11. Chrispino, Á. (2017). Introdução aos enfoques CTS – Ciência, Tecnologia e Sociedade (Documentos de Trabajo de Iberciencia, nº 4). Organização de Estados Ibero-americanos.

12. Dos Santos, F. M. (2012). Análise de conteúdo: A visão de Laurence Bardin. Revista Eletrônica de Educação, 6(1), 383–387. https://doi.org/10.14244/19827199291

13. De Lima, J. Á. (2013). Por uma análise de conteúdo mais fiável. Revista Portuguesa de Pedagogia, 7–29. https://impactum-journals.uc.pt/rppedagogia/article/view/1647-8614_47-1_1

Revista ARACÊ
ISSN: 2358-2472

14. Fochi, P. (2020). Criança, currículo e campo de experiências: Notas reflexivas. Conjectura: Filosofia e Educação, 25, 52–72.

15. Lorenzetti, L. (2000). Alfabetização científica nas séries iniciais [Dissertação de mestrado, Universidade Federal de Santa Catarina]. https://repositorio.ufsc.br/bitstream/handle/123456789/79312/161264.pdf?sequence=1&isAllowed=y

16. Mendes, R. M., & Miskulin, R. G. S. (2017). A análise de conteúdo como uma metodologia. Cadernos de Pesquisa, 47, 1044–1066. https://www.scielo.br/j/cp/a/ttbmyGkhjNF3Rn8XNQ5X3mC/abstract/?lang=pt

17. Oliveira, D. C. de. (2008). Análise de conteúdo temático-categorial: Uma proposta de sistematização. Revista de Enfermagem UERJ, 569–576.

18. Oliveira, Z. de M. R. (2018). Campos de experiências: Efetivando direitos e aprendizagens na educação infantil. Fundação Santillana.

19. Santos, F. M. dos. (2012). Análise de conteúdo: A visão de Laurence Bardin. Revista Eletrônica de Educação, 6(1), 383–387. https://www.reveduc.ufscar.br/index.php/reveduc/article/view/291

20. Silva, A. H., & Fossá, M. I. T. (2015). Análise de conteúdo: Exemplo de aplicação da técnica para análise de dados qualitativos. Qualit@s Revista Eletrônica, 17(1).

21. Silveira, R. M. C. F., & Bazzo, W. A. (2006). Ciência e tecnologia: Transformando o homem. Revista Gestão Industrial, 2(2), 68–86.